

DRAFT

Conservation Plan for

Western North Pacific Gray Whales

(Eschrichtius robustus)

(Do not cite without permission)

This Draft, June 2010

by

Brownell, R.L., Donovan, G.P., Kato, H., Larsen, F. *, Mattila, D., Reeves, R.R., Rock, Y.,
Vladimirov, V., Weller, D. & Zhu, Q.

*Corresponding author; Finn.Larsen@IUCN.ORG



CONTENTS

EXECUTIVE SUMMARY 6

1 INTRODUCTION 8

 1.1 Why a conservation plan is needed 8

 1.2 Overall objective of the conservation plan 9

2 LEGAL FRAMEWORK..... 9

3 BIOLOGY AND STATUS OF WESTERN GRAY WHALES..... 10

 3.1 Population structure 10

 3.2 Distribution, migration and movements..... 11

 3.3 Basic biology (feeding, reproduction and survivorship) 11

 3.4 Abundance and trends (including description of modelling framework)..... 13

 3.5 ‘Attributes’ of the population to be monitored..... 14

4 SUMMARY OF ACTUAL AND POTENTIAL ANTHROPOGENIC THREATS..... 15

 4.1 Actual and potential anthropogenic threats..... 15

 4.1.1 Entrapment in set nets 16

 4.1.2 Entanglement in other types of fishing gear 16

 4.1.3 Vessel strikes 17

 4.1.4 Deliberate killing..... 17

 4.1.5 Noise in feeding areas 18

 4.1.6 Oil spill direct effects 18

 4.1.7 Contamination of prey..... 19

 4.1.8 Noise in migratory routes..... 19

 4.1.9 Physical disturbance of prey..... 20

 4.1.10 Physical modification of coastal zone 20

 4.2 Monitoring..... 20

5 MITIGATION MEASURES 21

 5.1 Entrapment in set nets 21

 5.2 Entanglement in other types of fishing gear 21

 5.3 Vessel strikes 22

 5.4 Noise in feeding areas 22

 5.5 Oil spill direct effects 22

6 PUBLIC AWARENESS AND EDUCATION 23

7 EXECUTIVE SUMMARY OF ACTIONS..... 23

 7.1 Dealing with inadequate data 23

 7.2 Monitoring..... 24

 7.3 Life of the Conservation Plan 24

 7.4 Implementation of the Conservation Plan; co-ordination, involvement of stakeholders 24

 7.5 Tables of actions..... 25

8 ACTIONS 26

Action CORD-01: Implementation of the Conservation Plan: Co-ordinator and Steering Committee 27

 Description of action 27

 Initial budget items to be considered by ISC 28

 Actors 29

 Action evaluation 29

 Priority..... 29

Action CORD-02: Development of a Web-based exchange of scientific information 30

 Description of action 30

 Actors 30

 Action evaluation 30

 Priority..... 31

Action PACB-01: Develop a strategy to increase public awareness and build capacity in range states..... 32

 Description of action 32

 Initial budget items to be considered by ISC 33

 Actors 33

 Action evaluation 33

 Priority..... 33

Action RES-01: Determine movements, migration routes and location of wintering ground(s) through satellite telemetry..... 34

 Description of action 34

 Actors 34

 Action evaluation 35

 Priority..... 35

Action RES-02: Development of a GIS database on locations of set nets (both small-type and large-type) in the range of western gray whales..... 36

 Description of action 36

 Actors 36

 Action evaluation 36

 Priority..... 37

Action RES-03: Development of a GIS database on locations of gill nets and pot/trap gear (e.g. for crabs) in the range of western gray whales..... 38

 Description of action 38

 Actors 39

 Action evaluation 39

 Priority..... 39

Action RES-04: Identifying areas where western gray whales have a high risk of being exposed to oil spills..... 40

 Description of action 40

- Actors 41
- Action evaluation 41
- Priority..... 41
- Action MON-01: Ensure long-term monitoring of abundance and trends off Sakhalin Island through photo-identification and biopsy sampling..... 42
 - Description of action 42
 - Actors 42
 - Action evaluation 43
 - Priority..... 43
- Action MON-02: Ensure long-term monitoring of distribution, abundance and trends off south-eastern Kamchatka..... 44
 - Description of action 44
 - Actors 44
 - Action evaluation 44
 - Priority..... 44
- Action MIT-01: Release of gray whales entrapped in set nets 45
 - Description of action 45
 - Actors 46
 - Action evaluation 46
 - Priority..... 46
- Action MIT-02: Prevention of entrapment of gray whales in set nets 47
 - Description of action 47
 - Actors 48
 - Action evaluation 48
 - Priority..... 48
- 9 REFERENCES 49
- ANNEX 1 52
- 1 International conventions and agreements..... 52
 - 1.1 International Convention for the Regulation of Whaling 52
 - 1.2 Convention on the Conservation of Migratory Species of Wild Animals..... 52
 - 1.3 Convention on International Trade in Endangered Species of Wild Fauna and Flora..... 52
 - 1.4 International Maritime Organisation 53
 - 1.5 Regional fisheries bodies..... 53
 - 1.6 Russia-US bilateral agreement 54
 - 1.7 Other bodies that manage human activities in the marine environment 54
- 2 National legislation 55
 - 2.1 China, People’s Republic of 55
 - 2.2 Taiwan, Province of China 56
 - 2.3 Japan..... 57

2.4 Korea, People’s Republic of..... 59

2.5 Korea, Democratic People’s Republic of 60

2.6 Russian Federation 60



EXECUTIVE SUMMARY

The critically endangered western gray whale population, numbering only about 130 animals in 2008, remains on the edge of survival. Although recent data point to a slow increase, the additional death of just one mature female per year could send the population towards extinction. While much attention has centred on potential impacts associated with oil and gas activities in and near the population's primary feeding grounds off Sakhalin Island in the Russian Far East, the survival and recovery of western gray whales depends on prompt and effective conservation action throughout their range.

For a number of years, the International Whaling Commission (IWC) and a series of independent expert panels established by the International Union for Conservation of Nature (IUCN) have emphasised the urgent need for a comprehensive international strategy to eliminate or mitigate anthropogenic threats facing western gray whales throughout their range. The international Western Gray Whale Rangewide Workshop, convened by IUCN in Tokyo in 2008, summarised the state of knowledge regarding the population, identified information gaps, specified and ranked threats, mapped out needed research and management actions. Its primary recommendation was to develop and implement this conservation plan.

The overall goal of the Western Gray Whale Conservation Plan is to manage human activities that affect western gray whales and maximise the population's chances for recovery, based on the best scientific knowledge.

The conservation plan includes eight sections, of which the first three provide background information including biology and status of the western gray whale population. Section 4 reviews **actual and potential anthropogenic threats** and ranks these as low, moderate or high priority. Section 5 describes **mitigation measures** for those threats that have been accorded moderate or high priority. These include:

- **entrapment in set nets**
- **entanglement in other types of fishing gear**
- **vessel strikes**
- **noise in feeding areas**
- **direct effects of oil spills**

Section 6, dealing with **public awareness and education**, concludes that providing range state individuals, groups, organizations, governments and societies with access to information and knowledge about the status of western gray whales is essential for meeting the conservation objectives detailed in the conservation plan.

Section 7 outlines the actions called for and includes sub-sections on monitoring, on implementation and coordination of the conservation plan, and on involvement of stakeholders. In order to be effective, the conservation plan must have a recognised, **full-time Co-ordinator** who is responsible for *inter alia* actively involving stakeholders, especially those whose livelihoods may be affected (*e.g.* fishermen). The Co-ordinator should report to a **Steering Committee** closely linked to appropriate authorities. The Conservation Plan will be useless without sufficient implementation funding. At the very least, sufficient funds must be made available to support the appointment and functioning of a Co-ordinator and Steering Group.

Section 8 describes in detail the high priority actions identified at this stage (see table below). They fall under the following five headings: **Co-ordination**, **Capacity building and public awareness**, **Research essential for providing adequate management advice**, **Monitoring**, and **Mitigation measures**. Descriptions of the high priority actions follow a common format, which consists of **description of action** (specific objective, rationale, target, timeline), **actors** (responsible for co-ordination of the action, stakeholders), **action evaluation** and **priority** (importance, feasibility).

| Action nr. | Title of action |
|------------|--|
| CORD-01 | Implementation of the Conservation Plan: Co-ordinator and Steering Committee |
| CORD-02 | Development of a Web-based exchange of scientific information |
| PACB-01 | Development of a strategy to increase public awareness and build capacity in range states |
| RES-01 | Determine movements, migration routes and location of wintering ground(s) through satellite telemetry |
| RES-02 | Development of a GIS database on locations of set nets (both small-type and large-type) in the range of western gray whales |
| RES-03 | Development of a GIS database on locations of gill nets and pot/trap gear (e.g. for crabs) in the range of western gray whales |
| RES-04 | Identifying areas where western gray whales have a high risk of being exposed to oil spills |
| MON-01 | Ensure long-term monitoring of abundance and trends off Sakhalin Island through photo-identification and biopsy sampling |
| MON-02 | Ensure long-term monitoring of distribution, abundance and trends off south-eastern Kamchatka |
| MIT-01 | Release of entrapped gray whales in set nets |
| MIT-02 | Prevention of entrapment of gray whales in set nets |

The most critical and urgent action is the implementation of the Western Gray Whale Conservation Plan (CORD-01). Funding must be found for this action at the earliest opportunity to appoint a Co-ordinator and set up the Steering Group to ensure that the Conservation Plan moves ahead in a timely fashion.

1 INTRODUCTION

1.1 WHY A CONSERVATION PLAN IS NEEDED

The critically endangered western gray whale population, numbering only about 130 animals in 2008, remains on the edge of survival. Although a recent assessment predicts a slow increase, the additional death of just one mature female per year could send the population towards extinction. This population has been a focus of concern for a number of international bodies including the International Whaling Commission (IWC) and the International Union for Conservation of Nature (IUCN). While much attention has centred on oil and gas activities in and near the population’s primary feeding grounds off Sakhalin Island in the Russian Far East, the survival and recovery of western gray whales will depend on prompt and effective conservation action by all of its range States (Russia, Japan, Democratic People’s Republic of Korea, Republic of Korea and the People’s Republic of China) throughout their range (Fig. 1).

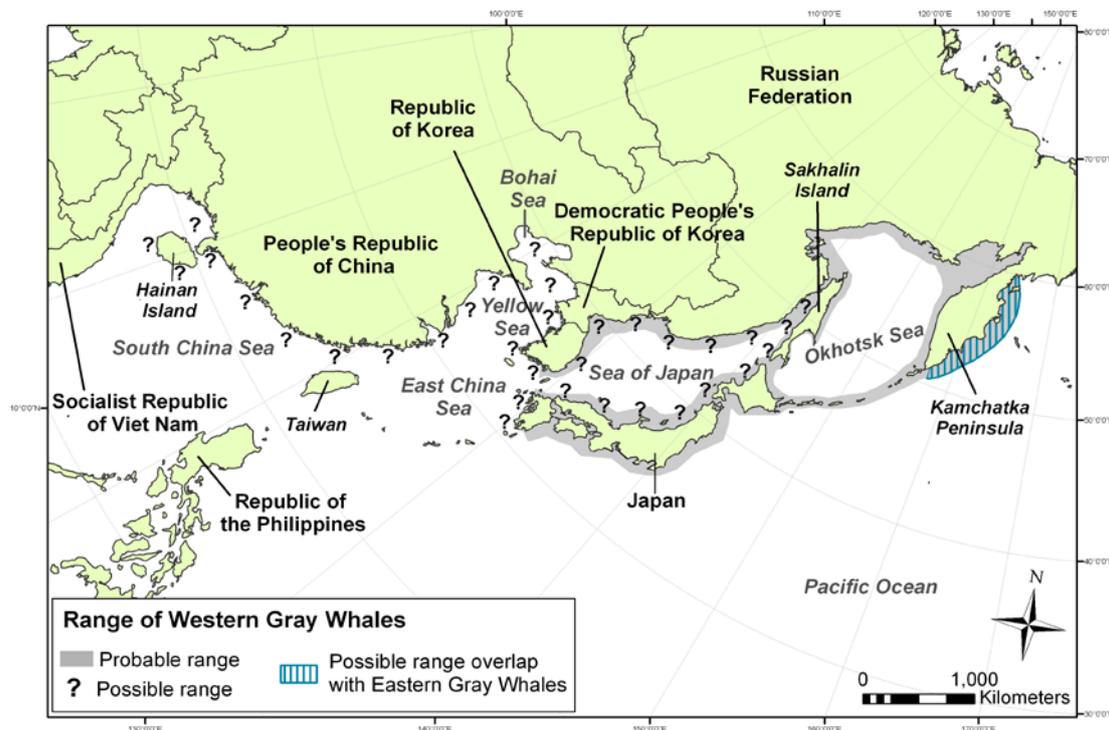


Fig. 1: Range of the western gray whale population (and see Item 3.2). Grey areas indicate the probable range while areas with question marks indicate the possible range of western gray whales. The striped area indicates a region where the ranges of eastern and western gray whales probably overlap.

For a number of years, the IWC and a series of independent expert panels established by IUCN have emphasised the urgent need for a comprehensive international strategy (with a substantial research component) to mitigate anthropogenic threats facing western gray whales throughout their range. This conservation plan was initiated at an IUCN-convened international workshop in Tokyo in summer 2008 (IUCN, 2009). The workshop summarised the state of knowledge, identified information gaps, specified and ranked threats, and mapped out needed research and management actions. Time is short and co-ordinated action, not just more words, is required now. High priority actions are identified at the end

of this document; their implementation should be immediate. The general structure and philosophy of this plan follows the guidance given in Donovan *et al.* (2008).

This conservation plan is not meant to be a definitive and unalterable document. Rather it is meant to be a framework for efforts to stimulate and guide the conservation of western gray whales, and as such it will need to be subject to regular re-evaluation and updating (see Item 8.3). Revisions can be made in response to a) the results of the high priority actions themselves, b) improved knowledge from ongoing research and monitoring in the light of the objectives of the plan or c) changing external factors or circumstances.

1.2 OVERALL OBJECTIVE OF THE CONSERVATION PLAN

Any conservation plan must have measurable objectives by which its success or failure can be evaluated, and to ensure that required changes are identified promptly. Thus monitoring of a) the western gray whale population, b) human activities c) implementation of mitigation measures and d) the effectiveness of those measures is integral and essential to the plan, not an optional extra.

We cannot manage western gray whales but we can manage human activities that affect their status. Thus, by its nature, this conservation plan calls for some degree of control and limitation on human activities. Its objectives are related not only to the conservation of the whale population but also to the needs and wishes of interested parties or stakeholders. In the case of a critically endangered population, the conservation-related objectives should come ahead of stakeholder interests whenever there are serious conflicts between the two.

The overall goal of this conservation plan is to manage human activities that affect western gray whales and maximise the population's chances for recovery, based on the best scientific knowledge.

In pursuing this goal, the needs and interests of stakeholders should be taken into account to the extent possible, whilst recognising that the improved conservation status of western gray whales is accorded highest priority. Moreover, scientific uncertainty must be adequately taken into account in determining appropriate actions, processes and priorities.

Ideally, all management actions are based on adequate scientific data. However, there will be occasions when the potential conservation consequences of waiting for confirmatory scientific evidence are so serious that it is better to take action immediately whilst collecting the necessary information. This has become known as following the “precautionary principle”. Application of the precautionary principle must be carefully considered and adequately justified. This can require the involvement of multiple stakeholders, including appropriate scientists. Early consideration should be given to the appointment of an advisory panel of scientists, similar in nature and function to that of the Western Gray Whale Advisory Panel (WGWAP).

2 LEGAL FRAMEWORK

A summary of information on relevant conventions, agreements and national regulations can be found in Annex 1 to this document. The full text will be available from the Western Gray Whale Rangewide Conservation Plan website, as soon as it becomes operational.

3 BIOLOGY AND STATUS OF WESTERN GRAY WHALES

3.1 POPULATION STRUCTURE

Within the North Pacific Ocean, gray whales occur as distinct eastern and western populations. The two populations are genetically differentiated based on mtDNA haplotype frequencies (LeDuc *et al.* 2002, Lang *et al.* 2010). Since mtDNA represents only maternal inheritance patterns, bi-parentally inherited microsatellite markers (n=14) have been used to measure differentiation between the populations as well as to compare levels of nuclear genetic diversity retained in each of them (Lang *et al.* 2010). Mean levels of genetic diversity were similar for the two populations, suggesting that a significant amount of nuclear genetic diversity has not been lost in the small western population. Comparison of microsatellite allele frequencies confirmed that the eastern and western populations are genetically distinct ($p < 0.001$). Although highly significant, the level of differentiation between them is relatively low, which may reflect recent divergence or indicate that a limited degree of dispersal or gene flow is occurring.

There is little information on contemporary migratory routes or wintering areas of western gray whales but it has been suggested that more than one route was used in the past. Any segregation of whales during the period when breeding occurs (winter to early spring) could result in population substructure. To explore the possibility of population substructure, three types of analyses have been used (Lang *et al.* 2008). Firstly, a clustering method was used to assess whether genetic markers could detect structure within the samples collected in the Sakhalin feeding area. Secondly, paternities of whales first observed as calves off Sakhalin were assessed to provide information on the proportion of successfully breeding males that has been sampled. Thirdly, genetic assignment tests were used to evaluate potential dispersal between the eastern and western populations.

The cluster analysis found no strong signal to indicate substructure within the western population although the possibility of such substructure could not be entirely ruled out on the basis of the results.

The paternity assessment was successful in assigning putative fathers to only 26 (47%) of the 55 calves. Given that 84% of the photo-identified individuals from Sakhalin had been genetically sampled, this low rate of paternity assignment was surprising. Possible explanations for this finding are (1) at least some individuals ('missing fathers') range more widely during the summer (*e.g.* to Kamchatka Peninsula or elsewhere) and have not been sampled in the Sakhalin feeding area and/or (2) not all whales observed off Sakhalin have been sampled and adult males, in particular, might be under-represented in the set of biopsy samples (Lang *et al.* 2008). Finally, it is important to examine statistically whether the low rate of successful paternity assignment is unexpected. This can be achieved by determining the expected percentage of paternities assuming a null hypothesis that the population is closed and mating is at random.

The genetic assignment tests identified a small number of animals sampled off Sakhalin as potential dispersers from the eastern population – four males and one female. None of the four males had been identified as a putative father of a Sakhalin calf and the female had never been sighted with a calf. It is also of interest that the genotype of a female sampled off eastern Kamchatka had a higher probability of belonging to the western than to the eastern population.

Information Gaps – Genetic assessments of whales sampled off Kamchatka, lack of genetic information on whales in areas of winter distribution.

3.2 DISTRIBUTION, MIGRATION AND MOVEMENTS

Western gray whales range (or at least ranged historically) along the coasts of the Russian Federation, Japan, the Democratic People's Republic of Korea, the Republic of Korea and the People's Republic of China. Other possible range states include the Socialist Republic of Viet Nam, the Republic of the Philippines and Taiwan Province of China (Fig. 1). There are no confirmed records of gray whales from Viet Nam, the Philippines and Taiwan, but American whalers in the 19th century reported seeing them in the middle of Taiwan Strait and off the northern coast of Taiwan (Henderson 1990). Based on the sparseness or lack of records in some areas (e.g. the Korean Peninsula, Taiwan), it is suspected that the current range is more restricted.

Gray whales migrate from winter breeding grounds suspected, but not confirmed, to be in the South China Sea to summer feeding areas off the northeastern coasts of Sakhalin Island and south-eastern Kamchatka (Weller *et al.* 2002). While the coastal waters of eastern Russia, the Korean Peninsula, and both sides of Japan have all been recorded as migratory corridors in the past 50 years, the current migration route(s) of the population is not well known (see reviews in Weller *et al.* 2002, 2008).

Information Gaps: Details on migratory timing and routes, winter distribution.

3.3 BASIC BIOLOGY (FEEDING, REPRODUCTION AND SURVIVORSHIP)

Feeding - Foraging by western gray whales has been observed primarily in the feeding areas off northeastern Sakhalin Island. A nearshore feeding area, adjacent to Piltun Lagoon, is generally in waters < 20 m deep. All foraging activity observed to date has involved benthic prey and disturbance to the benthos (as indicated by 'mud plumes' in the water). Foraging activity in the southern part of the Piltun feeding area is probably focussed on patches of the dominant benthic species, the amphipod *Pontoporeia affinis*. *P. affinis* is a mobile detritivore that does not form tubes on the sea floor. The ecosystem-level significance of predation on *P. affinis*, and of the associated disturbance to benthic habitats in the Piltun area, is unknown. There is circumstantial evidence suggesting that western gray whales feed on sandlance (*Ammodytes hexapterus*) in the northern portion of the Piltun feeding area during some years.

These whales also forage in a more offshore feeding area southeast of the nearshore Piltun feeding area. Benthic habitats there are deeper (40-50 m) and are dominated by ampeliscid amphipods. Such habitats may be similar ecologically to those of the eastern gray whales in the Bering Sea.

Selection of prey species by western gray whales has been inferred primarily from abundance patterns of benthic species considered likely prey. Confirmation of details concerning their diet is lacking. Faecal material from western gray whales is rarely observed and is reported to be difficult to collect. That said, a variety of species of amphipods (from the genera *Anisogammarus*, *Anonyx*, *Pontoporeia*, *Locustogammarus*) and isopods (of the genera *Saduria* and *Synidotea*) were collected from the scat of feeding whales (Würsig *et al.*, 2000). Prey ingestion has not been observed directly, and biochemical methods for dietary characterization have yet to be applied.

Western gray whales may forage in locations other than those thus far identified on the northeastern Sakhalin shelf. Gray whales have been seen in recent years near the Kurile and Commander Islands, off the mainland coast of Kamchatka and in the northern Sea of Okhotsk. Observations of feeding behaviour and defecation by gray whales in Olga Bay (Kamchatka) have been reported (Vertyanin *pers.comm.*).

Information Gaps: Diet, prey quality, comparative assessment of habitat quality (e.g., nearshore vs. offshore, Sakhalin vs. Kamchatka).

Reproduction - Research has been undertaken on birth intervals and sex composition of gray whales summering off northeastern Sakhalin Island. A total of 23 mothers and 68 calves were identified in the Sakhalin feeding area between 1995 and 2007. The number of calves recorded annually ranged between 2 and 11. The total number of calves observed with a given mother over the complete study period ranged from 1 to 5; 38 birth intervals were documented for 19 (82.6%) of the 24 reproductive females. The number of intervals available to be calculated per female ranged from 0 (for females that were sighted only one year with a calf) to 4 (for females that were observed with calves in five different years). Of the observed birth intervals, 50% (n = 19) were 2 years, 34% (n = 13) 3 years and 10.5% (n = 4) 4 years. In addition, there was one interval of 5 years and one of 6 years.

In the subset of 12 females for which more than one birth interval could be calculated, the interval remained stable for 6 (50%), decreased for 5 (42%) and increased for 1 (8%). In general, most females appeared to be maintaining stable intervals of 2 years (n = 5) or 3 years (n = 1) or to have experienced a shortening of the birth interval (n = 5).

Of the 68 western gray whale calves observed between 1995 and 2007, none has yet been observed to produce a calf of its own. However, in 2007, a whale first observed as a yearling in 2001 was sighted accompanied by a calf, and the parent-offspring relationship was subsequently confirmed through genetic analysis. Based on the presence of a full year of barnacle growth and associated scarring, which allows a clear visual distinction to be made between calves and yearlings (Bradford *et al.* In press), the age at first calving recorded for this female was 7 years. Assuming this whale conceived as soon as she was sexually mature, her age at sexual maturity would have been 6 years.

For all individuals (n = 142) sampled between 1995 and 2007, males predominated (58%). This was also true for the subset of whales sampled as calves (n = 59), of which 66% were male. The sex ratio of calves as a function of year was also biased; in 9 of 12 years (75%), males predominated.

The overall sex ratio of calves born to the 17 reproductive females that produced at least two calves of known sex during the study varied. Ten (59%) of these females had more males, including 5 individuals that produced only male offspring. In comparison, 3 females (18%) had more females, including 2 individuals that produced only female offspring. Finally, 4 females (23%) had an equal male to female calf ratio.

Information Gaps: Significance of male-biased sex ratio, age at first reproduction, sex ratio at birth, neo-natal mortality.

Survival - Ongoing studies of western gray whales have resulted in a photographic dataset that can be used for survival estimation. Bradford *et al.* (2006) applied Pollock's robust design to 129 individual whale encounter histories spanning 25 monthly capture occasions from 1997 to 2003. Using Akaike's Information Criterion (AICc) model selection, models incorporating individual heterogeneity in residency patterns and higher temporary emigration probabilities for younger whales provided the best fits to the data. Non-calf and calf (1st year post-weaning) survival was estimated at 0.951 (SE = 0.0135, 95% CI = 0.917 to 0.972) and 0.701 (SE = 0.0944, 95% CI = 0.492 to 0.850), respectively, based on averaging across the best models (n = 13) in order to account for model uncertainty.

A recent population assessment by Cooke *et al.* (2008), incorporating the same data used by Bradford *et al.* (2006) but inclusive through 2007, used a Bayesian individual-based, stage-structured model (see model description in item 3.4) to estimate western gray whale survival rates. This study produced similar, albeit higher, survival estimates compared with

those of Bradford *et al.* (2006). Here, the median parameter estimates (with 90% Bayesian confidence intervals) were 0.978 (0.967-0.987) for non-calf adult survival rate and 0.78 (0.69-0.86) for 'calf' survival rate (*i.e.* survival from first to second summer season).

Information Gaps: Survival from birth to first arrival on feeding ground, validation of assumption that all whales, at some point in time, visit Sakhalin feeding ground.

3.4 ABUNDANCE AND TRENDS (INCLUDING DESCRIPTION OF MODELLING FRAMEWORK)

The regular occurrence of gray whales in the summer months in the feeding areas off northeastern Sakhalin permits the collection of sufficient data for population assessment and monitoring. A stage-structured population model developed by Cooke *et al.* (2008) was fitted to a 1995-2007 time series of photo-identification data (supplemented with sex determinations from biopsies). The model divided the population into the following components for each year: male calves, female calves, immature females, calving females, resting females (mature but not calving in the current year) and other males. By fitting the model to the data, estimates of several population parameters of interest were obtained, including total population size and annual trend, numbers of whales in each population component, annual survival rate of yearlings and older animals, and inter-calf intervals. The model was also used to project the population into the future under a range of scenarios. Uncertainty was taken into account by formulating the model in probabilistic terms and considering several sources of uncertainty, *e.g.* gaps in the data (including animals absent in some years, missed calvings, calves with unknown mothers), demographic stochasticity (exacerbated by the small population size), environmental variability affecting reproduction, and sampling variability of parameter estimates.

Median estimates of key population parameters (with 90% Bayesian confidence intervals) resulting from this modelling exercise were, in addition to the survival rates given above, 2.5% (1.6% – 3.5%) for the average annual rate of population increase over 1994-2007 and 130 whales (120-142) for the 1+ (non-calf) population size in 2008. There remained an unexplained significant male:female bias of about 2:1 in the sex ratio of calves ($p < 0.01$). The number of mature females alive in 2008 was estimated at 27 (22-31).

The assessment results indicate that the population has been increasing, at least up to 2005. Forward projections of the model to 2050, assuming no additional mortality or disturbance to reproduction, indicate a high probability (>99%) of continued population increase. That being said, five whales (all female) were caught or found dead on the Pacific coast of Japan during 2005-2007, including four deaths in fishing nets (see Weller *et al.* 2008). One of the dead animals (found in 2007) had been identified off Sakhalin in 2006 (Weller *et al.* 2008). Projections of the female population incorporating this same level of 'extra' mortality (5 female whales per 3 years), on the assumption that all dead individuals are from the population that feeds off Sakhalin, and are not included in the estimated background levels of 'natural' mortality, indicated a high probability (~25%) of population decline and a substantial risk (~10%) of extirpation by 2050. Although this projection is merely an example scenario, it does illustrate the point that even a very small number of additional deaths, particularly of females, could jeopardize the recovery of the population.

Information Gaps: Mortality, validation of the assumption that all whales visit the Sakhalin near-shore feeding area at some point in time.

3.5 'ATTRIBUTES' OF THE POPULATION TO BE MONITORED

Nearly everything known about western gray whales in recent years has come from research and monitoring off Sakhalin Island. Continuation of the long and unbroken time series of photo-identification and other data from Sakhalin Island is essential. The primary 'attributes' (*i.e.* quantifiable characteristics) of the population that need to be monitored are **abundance** (number of individuals in the population), **annual number of first-year calves** that reach the feeding areas, and **overall trends in abundance** (whether the population is growing, declining or constant). The nature and level of recent effort (basically throughout the first decade of the 21st century) has been adequate to monitor these attributes. However, there is no assurance from one year to the next that such effort can be maintained.

It is important that, as an immediate first step, a power analysis is carried out to determine the scale of photo-identification effort, in terms of both days in the field and time interval between surveys, needed to detect any alarming change in abundance, calf production or trend for this population. According to the results of that analysis, it will be important as the next step to establish a reliable funding base and scientific capacity to assure monitoring at the required level into the future.

An additional attribute that should continue to be monitored at present is **body condition** of individual whales in the feeding areas. Again, a long time series of individual-animal data collected in the Sakhalin feeding areas is already available and this creates the possibility of detecting changes in condition (a potential proxy for animal health or quality of foraging habitat) over time. It should be feasible to couple the collection of data on body condition with the photo-identification work discussed in the preceding paragraph.

However, to verify its value in the longer-term, more research is required on the relationship between the various body condition indices observed and recorded for individuals in the field (*e.g.* proportion of whales classified as 'skinny') and the actual health and reproductive fitness of the identified whales. In addition there is a need to explore correlations between human activities that might affect the quality of foraging habitat (*e.g.* construction, seismic surveys) and such variables as body condition indices and calf counts in following years.

Finally, it will be important to monitor **whale distribution** as a population attribute that may reflect range contraction or expansion, responses to deteriorating or improving conditions in feeding or calving areas, or increased or decreased abundance. In this regard, continued monitoring of gray whales in the bays off south-eastern Kamchatka is a high priority.

4 SUMMARY OF ACTUAL AND POTENTIAL ANTHROPOGENIC THREATS

4.1 ACTUAL AND POTENTIAL ANTHROPOGENIC THREATS

Western gray whales face a number of both direct and indirect threats throughout their range (Table 1). Direct threats include entrapment and entanglement in fishing gear, collisions with vessels (vessel strikes), deliberate killing and the direct effects of oil spills. Indirect threats include noise in feeding areas and on migratory routes, physical disturbance and contamination of prey populations, and physical modification of the coastal zone.

Table 1: Summary of information on actual and potential threats

| Actual/potential threat | Anthropogenic activity | Evidence | Possible impact | Priority for action | Relevant actions |
|---|--|--------------------------------------|---|---------------------|---|
| Directly lethal threats | | | | | |
| Entrapment in set nets | Set net fishing | Strong | Mortality and serious injury to whales | High | RES-01 RES-02 MIT-01 MIT-02 PACB-01 |
| Entanglement in other types of fishing gear | Fishing with gillnets (set or drifting) and other gear that includes lines in the water column (e.g. crustacean traps) | Moderate (circumstantial) | Mortality, serious injury, impairment of ability to feed efficiently or to undertake other vital processes | High | RES-01 RES-03 |
| Vessel strikes | Ship traffic, particularly at speeds higher than 10 knots | Moderate (circumstantial) | Mortality, serious injury | Moderate | RES-01 |
| Deliberate killing | Systematic whaling (possibly in North Korea), opportunistic harpooning or shooting by fishermen or hunters | One beached carcass bearing harpoons | Probably low as long as legal protection is effective in the range states | Low | |
| Sub-lethal threats | | | | | |
| Noise in feeding areas | Offshore construction (e.g. oil platforms, pipeline burial), seismic surveys | Strong | Impaired efficiency of feeding, leading to compromised body condition. Possible abandonment of feeding area | Moderate to High | |
| Contamination of prey | Offshore oil and gas production, oil transport | Weak or Moderate | Reduced food availability, leading to compromised health | Low | |
| Oil spill direct effects | Offshore oil and gas production, oil transport | Weak or Moderate | Skin damage, fouling of baleen, damage to pulmonary and thoracic structures from inhalation of volatile components, and toxicity resulting from ingestion | Moderate to High | RES-01 RES-04 |
| Noise in migratory routes | Shipping primarily | Weak | Whales forced to change routes, increasing their energy needs or forcing them into high-risk areas | Low | |

| | | | | | |
|---------------------------------------|---|------|--|-----|--|
| Physical disturbance of prey | Offshore construction that mobilises sediment, onshore construction or development that increases runoff or discharge | Weak | Reduced quantity or quality of feeding habitat | Low | |
| Physical modification of coastal zone | Urban development (e.g. land reclamation), bridge, causeway or dam construction | Weak | Degradation or elimination of habitat for key life functions | Low | |

4.1.1 ENTRAPMENT IN SET NETS

Five gray whales (all females) were caught or found dead on the Pacific coast of Japan during 2005-2007, including four deaths in set nets. Projections of the female population incorporating this same level of ‘extra’ mortality (5 females every 3 years), on the assumption that all dead individuals are from the population that feeds off Sakhalin, and are not included in the estimated background levels of ‘natural’ mortality, indicated a high probability (~25%) of population decline and a substantial risk (~10%) of extirpation by 2050. A precautionary approach is therefore to eliminate mortality related to entrapment in set nets, or at least reduce it to the greatest possible extent. Gray whales trapped in set nets are usually alive and uninjured, and thus live release would be feasible in many cases.

An initial component of addressing the entrapment problem is to develop a GIS database containing locations of set nets of the kind known to catch whales, covering the entire known range of western gray whales (Action RES-02). Ultimately, the set net data should be combined with information on gray whale movements (e.g. from satellite tagging – Action RES-01) in order to identify areas of overlap where mitigation measures should be applied (e.g. entrapment prevention – Action MIT-02; live release – Action MIT-01).

Given the strong evidence for this threat and its serious impact, it is a **HIGH PRIORITY**.

4.1.2 ENTANGLEMENT IN OTHER TYPES OF FISHING GEAR

All species of large whales can become entangled, but some appear to be at higher risk, depending on, amongst other things, the extent of overlap of their distribution with gear, their morphology and their behaviour (especially feeding). Their propensity to feed near the bottom and the fact that their coastal migratory routes put them in close contact with concentrations of fixed fishing gear, suggest that western gray whales have a high risk of entanglement, and data from eastern gray whales appear to support this (e.g. Heyning and Lewis 1990). In the eastern Pacific, gray whales have been found entangled in salmon gillnets and seines, herring gillnets, net pens, longlines and traps (Baird *et al.* 2002). Analyses of gear removed from entangled whales in the USA indicate that whales can become entangled in any type of fixed (‘passive’) rope or net in the water column (Johnson *et al.* 2005). Although whales are probably at greatest risk of entanglement in feeding areas due to their behaviour and the overlap with fishing gear, they also become entangled while migrating and on breeding grounds (e.g. humpback whales in Australia, eastern gray whales). There have been no reports of entangled western gray whales apart from the four that died in set nets (see Item 4.1.1). However, in a study of scarring frequency based on identification photos taken at Sakhalin Island from 1995 to 2007, 24.9% of 169 animals were assigned at least one anthropogenic scar code in at least one body region, with 24.3% presumed to have been previously entangled in fishing gear at least once (Bradford *et al.* 2008). While various biases are associated with such a scar analysis (e.g. it only provides information about survivors), it suggests that interactions with fishing gear are common.

An initial component of understanding and addressing the entanglement problem is to develop, for the entire known range of western gray whales, a GIS database containing locations of large-mesh gill nets and pot/trap gear (*e.g.* for crabs) of the kind known to entangle whales (Action RES-03).

Ultimately, these data, like the set net data, will be combined with information on gray whale movements (*e.g.* from satellite tagging – Action RES-01) in order to identify areas of overlap where mitigation measures should be applied.

Given the extensive evidence worldwide that entanglement is a serious threat to cetaceans (Read *et al.* 2006), and considering the widespread use of entangling gear in coastal waters of at least China (Zhou and Wang 1994), this is considered an actual threat of **HIGH PRIORITY**.

4.1.3 VESSEL STRIKES

An initial evaluation of the magnitude of the threat of ship strikes on western gray whales in Japanese waters was presented at the Rangewide workshop (Kato *et al.* 2008). Judging from available evidence on the frequency of occurrence of collisions and what is known from systematic sightings programmes regarding the occurrence of western gray whales relative to other cetaceans, the authors judged the probability of vessel strikes on gray whales in Japan to be extremely low or negligible.

Also at the Rangewide workshop, Bradford *et al.* (2009) presented a scarring study, which identified a number of scars as being the result of vessel strikes. Those authors concluded that 1.8% of the gray whales at Sakhalin had survived at least one vessel collision.

For this critically endangered population, the absolute number of ship strikes is more important than the probability of strikes. Therefore, it is important to identify areas of overlap between migration routes (see Action RES-01) and high levels of ship traffic and to establish precautionary mitigation measures there.

Given the scale of vessel traffic in the region, this is considered an actual threat of **MODERATE PRIORITY**.

4.1.4 DELIBERATE KILLING

The most recent deliberately caused death of a western gray whale was off the west coast of Hokkaido in May 1996 (Brownell and Kasuya 1999, Uni and Kasuya 2002). Several harpoons (with lines) were attached to this whale when it was found on the beach and it therefore appeared that hunting had been the cause of death. The gear matched that used by Japanese fishermen who hunt Dall's porpoises. Although it is uncertain how often, where and by whom such harpooning (or shooting) occurs, there is no evidence to suggest that deliberate wounding or killing of western gray whales happens other than occasionally.

The one part of the population's range where deliberate killing may be legal is the Democratic People's Republic of Korea (North Korea). It was noted in the Rangewide workshop report that North Korea had issued postage stamps in 1964, 1972 and 1974 showing images of an operating whaling catcher boat, and the 1974 issue was accompanied by presidential encouragement. Given the political isolation and socio-economic circumstances of North Korea, it is impossible to determine whether there is any active hunting of whales there.

If there were evidence to suggest that deliberate killing took place regularly or frequently, action to prevent it would be a high priority. However, under the circumstances and in the

light of available evidence, this is considered a potential rather than actual threat, and it is assigned a **LOW PRIORITY**.

4.1.5 NOISE IN FEEDING AREAS

Western gray whales are exposed to noise associated with oil and gas activities in their feeding areas near Sakhalin Island and likely in their breeding area(s) as well (although the location/s is/are unknown). The potential impacts of anthropogenic noise associated with oil and gas development have been the focus of concern and discussions of the various IUCN panels since 2004 (Reeves *et al.* 2005, WGWAP 2006, 2007a, 2007b, 2008, 2009a, 2009b, 2010).

The Rangewide workshop noted that there are good reasons to minimise noise exposure on the feedings grounds (*i.e.* reduce stress and ensure that the whales obtain optimal nutrition during this phase of their annual cycle). The point was made that most mothers in the western gray whale population bring their calves to the near-shore feeding area off Sakhalin during the summer. Until approximately a decade ago, this area would have been relatively quiet; it is only in the last 10-15 years that significant underwater noise has become a feature of this area.

Given the evidence that this threat may result in impaired efficiency of feeding, leading to compromised health, and even to the possible abandonment of the feeding area, attention to this threat should have **MODERATE to HIGH PRIORITY**.

4.1.6 OIL SPILL DIRECT EFFECTS

The threat to gray whales from oil in water can be direct or indirect, *i.e.* on the whales themselves or on their prey (see Item 4.1.7). The direct effects involve contact between the oil and the whale, potentially leading to skin damage, fouling of baleen, damage to pulmonary tissue from inhalation of volatile components, and toxicity resulting from ingestion. There is some possibility that whales would be able to detect and avoid concentrations of oil on the surface or in the water column, but it cannot be assumed that they will. What little evidence there is (see Reeves *et al.* 2005) suggests that gray whales do not exhibit a strong or effective avoidance response upon encountering surface oil slicks. The risk of exposure to spilled oil has been assessed specifically with reference to the oil being extracted from the Sakhalin Shelf and transported away from Sakhalin Island by one of the companies operating there (Sakhalin Energy Investment Company) (see Reeves *et al.* 2005 and WGWAP reports) but no similar assessments are available for other oil and gas projects in that region. Nor has there been an assessment of the risk to western gray whales from oil spills in their migration routes and wintering area(s), including tanker spills of crude oil and spills of fuel oil from all types of vessels. Such assessments are needed before mitigation action can be planned (Action RES-04).

Although a catastrophic oil spill within the range of western gray whales may be a low probability event, the potential for serious harm to the population should such a spill occur justifies assigning a **MODERATE to HIGH PRIORITY** to this threat.

4.1.7 CONTAMINATION OF PREY

Contamination of gray whale prey can happen from a number of sources. Most important are probably contamination from oil spills and contamination with persistent organic pollutants (POPs). Effects of oil spills would involve contact of spilled petroleum with prey populations and habitats. Potential acute impacts are those associated with direct contact of spilled oil with individual prey animals. Potential chronic impacts are those that develop over time when spilled oil is incorporated into benthic sediments where key prey populations dwell.

Persistent organic pollutants (POPs) typically are incorporated into an animal's tissues by ingestion and digestion of prey. POPs are generally lipophilic and tissue levels are magnified across trophic levels of marine food webs. In marine mammals, POPs concentrate in the blubber layer and may be mobilised in milk during periods of lactation. The major categories of POPs of concern in marine ecosystems include the polychlorinated biphenyls (PCBs), the dichloro-diphenyl-trichloroethanes (DDTs), the chlordanes, the hexachlorocyclohexanes (HCHs) and the polybrominated diphenyl ethers (PBDEs). PCBs were developed for use in a number of industrial applications, including insulation of electrical transformers. DDTs, chlordanes and HCHs are pesticides. PBDEs are a relatively new category of POP used as flame retardants in a number of commercial products.

Of particular concern to marine mammals is the tendency for POPs stored in blubber to be mobilised metabolically during lactation. The result is that offspring receive a substantial inoculum of POPs as a transfer from their mothers during nursing. This process introduces several key patterns in POP body burdens of marine mammals that link to age and sex. For example, the firstborn offspring of a given female generally receives a larger dose of POP contamination pre-weaning than subsequent offspring. Because adult females can 'offload' POP burdens during lactation, adult females typically carry lower POP concentrations than males of comparable age, once the age of first reproduction has been reached.

The nature of dose-response relationships of POPs in marine mammals is not well known. Although contaminant levels can be readily measured if blubber biopsies can be obtained in the field, the physiological consequences of observed POP body burdens generally are unknown in marine mammals.

The Rangewide workshop noted, however, that even though gray whales are benthic foragers, they are not known to accumulate what are considered dangerously high fractions of organochlorine contaminants in their body tissues (O'Shea and Brownell 1994, Krahn *et al.* 2001). Given this, attention to it should be accorded **LOW PRIORITY**.

4.1.8 NOISE IN MIGRATORY ROUTES

The coastal habits of gray whales often bring them into direct contact with human activities in coastal waters. During their annual migrations, whales in both the eastern and western populations pass through military training ranges, oil and gas exploration/development areas and shipping lanes that converge at some of the world's busiest and largest port cities, and may be subjected to noise disturbance in these areas. This could force them to change routes, thereby increasing their energy needs, or force them to adjust their movements in ways that place them at greater risk of entanglement/entrapment or ship strike. On the other hand, in some situations it may be desirable for the whales to respond to noise as it could keep them away from areas of high risk.

Given the weak evidence for this threat at present and the uncertainty as to its effects, attention to this threat should have **LOW PRIORITY**.

4.1.9 PHYSICAL DISTURBANCE OF PREY

There is concern that the installation of offshore oil and gas platforms in coastal waters will lead to unpredictable and intractable changes in the local benthic ecology. This potential threat was raised by the ISRP, noting that the construction of oil and gas pipelines from offshore platforms to landfall sites could (a) directly eliminate feeding habitat due to excavation and (b) result in smothering of benthic species (gray whale prey) by sediment that becomes mobilised during dredging and is then re-deposited (see Reeves *et al.* 2005). In the case of structures already in place, it is too late to influence their locations or to implement mitigation measures during construction. However, the concerns raised by the ISRP need to be borne in mind with respect to both the need for long-term monitoring of ecological effects and the planning of additional infrastructure construction in or near western gray whale feeding habitat. Harbour dredging, trawl fishing and onshore construction activities that increase runoff or discharge are additional subjects of concern in relation to this potential threat.

Given the weak evidence for this threat at present and the uncertainty as to its effects, attention to this threat should have **LOW PRIORITY**.

4.1.10 PHYSICAL MODIFICATION OF COASTAL ZONE

Changes in the physical structure and morphology of the shoreline in areas used by western gray whales might affect their reproductive or foraging success. For example, the whales' access to bays or lagoons may be compromised by urban development in southern China. However, there is no clear evidence that western gray whales depend (or depended historically) on coastal subtropical lagoons as calving and nursery areas in the same way as eastern gray whales do.

Given the weak evidence for this threat at present and the uncertainty as to its effects, attention to this threat should have **LOW PRIORITY**.

4.2 MONITORING

Any active species conservation effort requires that human activities are monitored over time in order to determine whether threats are worsening or improving. Such monitoring is essential for assessing the appropriateness and effectiveness of mitigation measures. Thus, in the case of western gray whales, it is important to know, for example, whether the number of set nets is increasing or decreasing in areas where entrapment is known or expected to occur, whether fishing effort with other types of potentially threatening gear is increasing or decreasing, how vessel traffic is changing (*e.g.* number and size of vessels, speeds, routing) and if underwater noise in feeding areas is getting worse. In all cases, the first step is to establish a baseline.

Two specific actions are identified here to address threat monitoring. The highest priority action is to map the locations of set nets (Action RES-02) and the next-highest priority action is to map the locations of gill nets and pot/trap gear (Action RES-03). In addition to these actions, any baseline study of other threat factors should be encouraged.

5 MITIGATION MEASURES

This section deals only with threats that are considered at this stage to be of moderate or high priority and where mitigation measures can be identified. This includes entrapment in set nets, entanglement in other types of fishing gear, vessel strikes, noise in feeding areas and direct effects of oil spills.

5.1 ENTRAPMENT IN SET NETS

An initial component of understanding and addressing the entrapment problem is to develop, for the entire known range of western gray whales, a GIS database containing locations of set nets of the kind known to catch whales (Action RES-02).

Ultimately, the set net data should be combined with information on gray whale movements (*e.g.* from satellite tagging – Action RES-01) in order to identify areas of overlap where mitigation measures should be applied (*e.g.* live release – Action MIT-01; entrapment prevention – Action MIT-02).

Gray whales entrapped in set nets are usually alive and uninjured, and thus live release would be feasible in many cases as has been demonstrated recently by the live release of a few large baleen whales from set nets in Japan. Highest priority should therefore be given to developing, in cooperation with the set net cooperatives, methods for live release of gray whales from the set nets (Action MIT-01). These methods need to be sufficiently flexible so that they can be adapted to function with the various types of set nets used within the range of western gray whales. Once such methods have been developed and tested, the fishermen belonging to the cooperatives should be trained in their use. Training should be accompanied by public and targeted awareness/education campaigns (Action PACB-01).

In parallel with the development and implementation described above, methods for prevention of gray whale entrapment in set nets should be developed in cooperation with set net cooperatives (Action MIT-02). Once such methods have been developed and tested, the fishermen belonging to the cooperatives should be trained in their use. Training should be accompanied by public and targeted awareness/education campaigns (Action PACB-01). Legislative or regulatory action should be introduced if deemed necessary.

5.2 ENTANGLEMENT IN OTHER TYPES OF FISHING GEAR

An initial component of understanding and addressing the entanglement problem is to develop a GIS database containing locations of large-mesh gill nets and pot/trap gear (*e.g.* for crabs) of the kind known to entangle whales for the entire known range of western gray whales (Action RES-03). Ultimately, these data, like the set net data, will be combined with information on gray whale movements (*e.g.* from satellite tagging – Action RES-01) in order to identify areas of overlap where mitigation measures should be applied.

Mitigating large whale mortality from entanglements in fishing gear is most efficiently implemented by establishing ‘disentanglement networks’ such as those in Australia, Canada, Mexico, New Zealand, South Africa, United Kingdom and United States of America. If an entangled whale does not drown immediately, there is almost always ample time to prepare appropriate resources for a successful release attempt. Therefore, virtually all disentanglement networks have adopted an ‘emergency team’ approach. Such a team consists of trained individuals who have access to specially designed equipment and who are transported to the scene, often by the national Coast Guard or Navy, to work with local fishermen to release the whale. Members of the team generally have expertise in whale behaviour and anatomy as well as experience handling ropes and small vessels under heavy

load and stress. For example, a team often includes at least one biologist and at least one fisherman.

Currently, there are no well-established disentanglement teams in the range states of western gray whales. If Actions RES-01 and RES-03 identifies areas of overlap where mitigation measures should be applied, development of a disentanglement capacity in these areas would be needed and would involve *inter alia* planning, procurement (and maintenance) of equipment and training, all of which would require funding. These activities should be accompanied by public and targeted awareness/education campaigns (see Action PACB-01).

5.3 VESSEL STRIKES

As explained above in section 4.1.3, some information is available on the overlap between high-volume vessel traffic and gray whale occurrence in Japanese waters and there is a clear need to improve the state of knowledge on the overlap there and elsewhere so that mitigation measures can be implemented in the highest-risk areas. Information on gray whale movements obtained from satellite tagging (Action RES-01) will be vital to risk assessment. Once migration routes and wintering distribution are better known, it will be important to carry out geographically focussed studies of ship traffic, and then to identify specific mitigation actions to be taken in key areas. Measures that involve the posting of onboard observers to detect whales and direct vessels safely around them are of limited effectiveness (especially during sub-optimal viewing conditions and at night). No satisfactory technological approach to ship strike risk reduction has been developed as yet. The most effective mitigation measures are to change vessel routing to avoid areas where there is a high probability of encountering whales and to slow vessel speeds when such avoidance is impractical.

5.4 NOISE IN FEEDING AREAS

As indicated in section 4.1.5, underwater noise in feeding areas is a major concern for western gray whales. The noise of greatest concern is that associated with oil and gas development, specifically seismic surveys, offshore platform construction and pile driving. To date, this topic has been addressed primarily through the independent efforts of oil and gas operators working on or near the Sakhalin near-shore feeding area (*e.g.* Johnson *et al.* 2007) and through the IUCN western gray whale panels (ISRP, IISG, WGWAP) linked to the Sakhalin II Phase 2 project of Sakhalin Energy Investment Company (Reeves *et al.* 2005, WGWAP 2006, 2007a, 2007b, 2008, 2009a, 2009b, 2010).

Although this threat is rated as a moderate to high priority, no new mitigation actions are proposed in this conservation plan because, for the present at least, the WGWAP provides an ongoing mechanism for addressing the noise issue in the population's primary feeding area. It will be important to re-evaluate the need for additional actions as noise-producing activities spread to other western gray whale feeding areas.

5.5 OIL SPILL DIRECT EFFECTS

An initial component of addressing the direct effects of oil spills on western gray whales is to determine to what extent these whales are at risk of contact with spilled or leaked oil. This should be the focus of a research action, RES-04, where information on whale movements (*e.g.* from satellite tagging – Action RES-01) is combined with information on the location of offshore oil production facilities, tanker traffic corridors and shipping lanes generally, with particular attention to sites where the risk of spills is judged to be high. Risk analyses should

then be carried out to identify areas of spatial and temporal overlap where mitigation measures should be applied.

Experience with major oil spills (*e.g.* the *Exxon Valdez* spill in 1989) indicates that the two most effective mitigation strategies are prevention and preparation (Stevens and Aurand 2008). The advantages of prevention are obvious, but preventive efforts are never foolproof and, regardless of how rigorous they may be, spills (or pipeline leaks) are bound to happen because they almost always involve human error. Therefore, adequate preparations for dealing with oil spills and leaks are essential as 'a second line of defence'. This means that response measures need to be: "- - adequately funded, of appropriate scale and scope, fully supplied and equipped and operational *prior* to spill events - -" (Reeves *et al.* 2005).

6 PUBLIC AWARENESS AND EDUCATION

The great difficulty of locating western gray whales in areas outside of their summer feeding grounds, combined with the near total absence of information about their wintering grounds and migration routes, highlight the need for increased capacity building and public awareness in all of the range states. Providing range state individuals, groups, organizations, governments and societies with suitable access to information and knowledge about the status of western gray whales is essential for meeting the conservation objectives detailed herein. This outreach could be effectively undertaken by use of the mass media, including: internet, newspaper, radio and television. Other activities, including public lectures and forums, education programmes for teachers and students of all ages, and dissemination of information in written and spoken form to whale watch boats and other eco-tourism operations would also be an effective means of increasing public awareness.

Capacity building, while similar to public outreach, differs somewhat in that the overarching objective is to foster the procurement of skills and abilities of key individuals and organizations within each of the range states. An example of capacity building would be the training of fisherman to release gray whales from set nets (see MIT-01 and MIT-02). The transfer of necessary skills is but the initial step, however, in this process. Ultimately, it is hoped that training efforts will translate into both legislative actions and commitment of necessary resources required to assist with the conservation of western gray whales throughout their range.

7 EXECUTIVE SUMMARY OF ACTIONS

Before moving to the specific actions, there are some important general considerations that require elucidation regarding the nature and usefulness of conservation plans (and see Donovan, Cañadas and Hammond 2008).

7.1 DEALING WITH INADEQUATE DATA

While ideally, all conservation plans and associated management actions are based on full and adequate scientific data, there are occasions when the potential conservation consequences of waiting for confirmatory scientific evidence may mean that it is better to take action immediately whilst collecting the necessary information. This has become known as following the "Precautionary Principle". However, application of the precautionary principle must be carefully considered and adequately justified.

One of the main challenges encountered in the process of developing this initial version of the Conservation Plan has been that a lack of data, both with respect to:

- (1) the target species (*e.g.* stock structure, movements and feeding ecology); and

(2) human activities and their actual/potential impact at different levels (e.g. adequate data on “effort / scale” of certain human activities; adequate data on the effect(s) on the species).

An important part of developing this Conservation Plan has thus been to identify the major information gaps in order to improve conservation measures. In response to this, the actions include a number of research and monitoring actions which work towards obtaining the necessary baseline information for the establishment of adequate scientifically-based management actions.

7.2 MONITORING

Establishing the necessary baseline information as a scientific reference for conservation actions is only the first step for effective conservation. Once this is achieved, as many have stressed (e.g. Donovan 2005), monitoring (of the species concerned, human activities, implementation of mitigation measures and effectiveness of those measures) **must** be seen as an integral and essential part of management, not an optional extra in order to obtain information on trends in the conservation status of our target species to examine the effectiveness of the management actions and if necessary adjust them to achieve our established conservation aims.

7.3 LIFE OF THE CONSERVATION PLAN

No conservation plan should be regarded as a definitive and unalterable document. It is rather a document that covers a temporal phase within the framework of the efforts for the conservation of a species, and therefore needs to be reviewed periodically to adjust the actions to the diverse changes that can occur, either in response to the results of the monitoring of the conservation plan actions themselves or to changing external factors.

It is proposed that the Western Gray Whale Rangewide Conservation Plan is reviewed annually and updated as needed and that a more thorough review is conducted every three years (see 8.4).

7.4 IMPLEMENTATION OF THE CONSERVATION PLAN; CO-ORDINATION, INVOLVEMENT OF STAKEHOLDERS

Experience has shown that in order to be effective, Conservation Plans must have a recognised, full-time co-ordinator. This is particularly true where effective conservation requires action (including legislative action) by a number of stakeholders including: intergovernmental and national authorities; scientist from several disciplines; representatives from industry; local communities; and interested NGOs. We do not believe that it is sufficient for such a Plan to be run part-time. Ideally, the Co-ordinator should have a scientific and management background and be an effective communicator to the various stakeholders. The importance of actively involving stakeholders, especially those whose livelihoods may be affected (e.g. fishermen), cannot be overemphasised. The Co-ordinator should report to a Steering Committee appointed with close collaboration between appropriate authorities (see also Action CORD-01).

Amongst other things, the Co-ordinator/Steering Committee would be asked to:

- promote and coordinate the implementation of the Conservation Plan (including investigating funding) with particular attention paid to direct stakeholders;
- gather information on its implementation, the results obtained, the objectives reached, and the difficulties encountered;

- communicate this information to the general public through regular reporting in an accessible format;
- appoint a group of experts to evaluate the effectiveness of the Conservation Plan every three years and to update it. The conclusions of this group should be made public.

Finally, it has to be stressed that a Conservation Plan will not be effective without sufficient funding. At the very least, sufficient funds must be made available for the appointment of a co-ordinator and the functioning of the Steering Group at the earliest opportunity.

7.5 TABLES OF ACTIONS

Co-ordination actions

| Nr. | Action | Importance | Feasibility | Crossref. |
|---------|--|------------|-------------|-----------|
| CORD-01 | Implementation of the Conservation Plan: Co-ordinator and Steering Committee | ESSENTIAL | HIGH | |
| CORD-02 | Development of a Web-based exchange of scientific information | HIGH | HIGH | PACB-01 |

Capacity building and public awareness actions

| Nr. | Action | Importance | Feasibility | Crossref. |
|---------|---|------------|-------------|-----------|
| PACB-01 | Development of a strategy to increase public awareness and build capacity in range states | HIGH | HIGH | CORD-02 |

Research actions essential for providing adequate management advice

| Nr. | Action | Importance | Feasibility | Crossref. |
|--------|--|-----------------|-------------|--------------------|
| RES-01 | Determine movements, migration routes and location of wintering ground(s) through satellite telemetry | HIGH | HIGH | CORD-02 PACB-01 |
| RES-02 | Development of a GIS database on locations of set nets (both small-type and large-type) in the range of western gray whales | HIGH | HIGH | RES-01 |
| RES-03 | Development of a GIS database on locations of gill nets and pot/trap gear (e.g. for crabs) in the range of western gray whales | HIGH | HIGH | RES-01 |
| RES-04 | Identifying areas where western gray whales have a high risk of being exposed to oil spills | MODERATE - HIGH | HIGH | RES-01 |

Monitoring actions

| Nr. | Action | Importance | Feasibility | Crossref. |
|--------|---|------------|-------------|-----------|
| MON-01 | Ensure long-term monitoring of abundance and trends off Sakhalin Island through photo-identification and biopsy sampling for genetics | HIGH | HIGH | |
| MON-02 | Ensure long-term monitoring of distribution, abundance and trends off south-eastern Kamchatka | HIGH | HIGH | |

Mitigation measure actions

| Nr. | Action | Importance | Feasibility | Crossref. |
|--------|---|------------|-------------|-----------|
| MIT-01 | Release of entrapped gray whales in set nets | HIGH | HIGH | PACB-01 |
| MIT-02 | Prevention of entrapment of gray whales in set nets | HIGH | HIGH | PACB-01 |

8 ACTIONS

The Actions are provided below, with each action beginning on a new page. At present no costs are associated with these actions but they will undoubtedly be expensive. One of the first tasks for the Co-ordinator/Steering Committee will be to develop detailed specifications for each action and where appropriate, assign costings and likely sources of funding.

ACTION CORD-01: IMPLEMENTATION OF THE CONSERVATION PLAN: CO-ORDINATOR AND STEERING COMMITTEE

Co-ordination Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objectives:** To ensure that timely progress is made with respect to the overall implementation of the Conservation Plan and the specific actions included therein, and to provide progress reports for the appropriate bodies including IUCN, the IWC, the range states and regional stakeholders, thereby maximising the chances of survival and recovery of the western gray whale population.
- **rationale:** This Conservation Plan is complex and for it to be effective it will require considerable co-ordination. Its success is dependent on a large number of stakeholders in a number of countries and a broad range of areas of expertise. Without a full-time co-ordinator to support a larger representative stakeholder Steering Committee, it is highly unlikely that the Conservation Plan will be successfully implemented.
- **target:** The appointment of a Steering Committee for the Conservation Plan and the appointment of a suitably qualified (international conservation science background) full-time Co-ordinator, with appropriate logistical and financial support.

It is envisaged that the Co-ordinator will be based in (but independent of) an IUCN office, that can provide the necessary logistical support. It should be noted that while logistical and other support from a host institution should be paid for at an appropriate rate, it would not be appropriate for overheads to be charged by the host institution on all actions funded.

In order to ensure rapid progress, an interim steering committee comprising the authors of the draft Conservation Plan (Donovan, Larsen, Reeves, Weller, Brownell, Kato, Rock, Mattila, Vladimirov and Zhu) will undertake the initial work outlined in the timeline below. It will then be appropriate for a broader stakeholder steering committee to be established with specific terms of reference and *modus operandi*. One of the first tasks of the Steering Committee will be to assess the need for national Sub-coordinators in each of the range states.

- **timeline:**

| | WHAT | WHO | WHEN |
|-----|---|----------------------------------|----------------|
| (1) | Identification of host institution and agreement on hosting conditions (initial contact with IUCN) | Interim Steering Committee (ISC) | September 2010 |
| (2) | Development of detailed job description and conditions of work based on the tasks outlined below | ISC | September 2010 |
| (3) | Identification of initial funds | ISC | October 2010 |
| (4) | Recruitment of co-ordinator | ISC | November 2010 |
| (5) | Co-ordinator begins work (initial 3/5 year contract) | Co-ordinator | January 2011 |
| (6) | Development of proposed terms of reference and <i>modus operandi</i> for stakeholder Steering Committee | IUCN, IWC, ISC, funders | February 2011 |

| | | | |
|-----|-----------------------------------|-------------------------|---------------------|
| (7) | Appointment of Steering Committee | IUCN, IWC, ISC, funders | As soon as possible |
|-----|-----------------------------------|-------------------------|---------------------|

- **tasks of co-ordinator in conjunction with steering committee:**
 - To assess the need for national Sub-coordinators in each of the range states.
 - To promote and explain the Conservation Plan and progress with its implementation to relevant stakeholders, including:
 - International and supranational bodies.
 - Range states.
 - Industry representatives incl. fisheries, hydrocarbon exploration, shipping etc.
 - Local authorities.
 - NGOs.
 - To raise funds for and manage the Western Gray Whale Conservation Plan Fund including, where necessary, assigning contracts to ensure that the Actions of the Conservation Plan are undertaken and completed.
 - To liaise with relevant authorities to facilitate the obtaining of any permits required to undertake Actions of the Conservation Plan.
 - To: (1) develop an appropriate data availability agreement that respects the rights of researchers; and (2) facilitate data sharing agreements that ensure that existing and new data are made available in timely fashion to maximise their value for western gray whale conservation.
 - To develop an appropriate database or databases and co-ordinate the collation in an appropriate electronic format, of data relevant to the implementation of the Conservation Plan including data collected as part of the Actions of the Plan. This should include the facilitation of the use of data on anthropogenic activities, environmental data and whale data in a GIS context.
 - To maintain and update the existing list of international and national regulations and guidelines, that are relevant to the conservation and management of western gray whales (see Annex 1).
 - To produce concise Annual Progress reports on the implementation of the Conservation Plan.
 - To arrange for periodic expert reviews of the Conservation Plan including the development of new actions as appropriate
 - To develop a western gray whale Conservation Plan website as a resource for researchers, stakeholders and the general public.

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

- Recruitment process (*e.g.* advertising, travel and subsistence for ISC and shortlisted candidates).
- Host institution annual costs (need to be negotiated by ISC).
- Salary of Co-ordinator (level, tax and benefits issues).
- Initial working budget for co-ordinator (travel and subsistence including visits to range states and meetings with stakeholders).

ACTORS

- **responsible for co-ordination of the action:** The ISC to identify the host institution, obtain initial funding and appoint the co-ordinator; IUCN and IWC, to appoint the broader stakeholder Steering Committee for the Conservation Plan.
- **stakeholders:** As listed above under 'Tasks'.

ACTION EVALUATION

- IUCN, IWC.
- Regular (*e.g.* biennial or triennial) meetings open to stakeholders.

PRIORITY

- **importance:** Essential
- **feasibility:** High if political will is there

ACTION CORD-02: DEVELOPMENT OF A WEB-BASED EXCHANGE OF SCIENTIFIC INFORMATION

Co-ordination Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** Develop a web-based forum by which scientific information (*e.g.* photo-ID catalogue, tissue sample database, sighting record registry) can be maintained in a centralized location and freely exchanged among interested parties (also see CORD-01).
- **specific threats to be mitigated:** While not a mitigation action *per se*, this action will provide a valuable framework for the exchange of information necessary to develop and/or monitor the effectiveness of mitigation measures.
- **rationale:** Integration of information on western gray whales from all areas where they are observed (*e.g.* Sakhalin Island, Kamchatka, Japan and elsewhere) is of substantial value in understanding patterns of habitat use, links between geographic areas and in determining migration routes and wintering area location(s). Having a centralized data repository where all interested parties (including the public) would be able to share and exchange information on western gray whales in accordance with an agreed data availability protocol (see CORD-01) would benefit conservation measures at a broader (*i.e.* rangewide) geo-spatial scale.
- **target:** Creation of a centralized data exchange forum allowing for information sharing and integration amongst interested parties should be developed as soon as possible, realistically beginning January 2011 upon full-time engagement of the Conservation Plan Co-ordinator.
- **method:** The Conservation Plan Co-ordinator will arrange for the design and implementation of a web-based forum (see CORD-01) to facilitate the exchange of data relevant to western gray whale conservation that would incorporate: 1) photo-identification data/catalogue, 2) information on genetic samples and analyses, 3) sighting records, 4) stranding and necropsy data, 5) current and future anthropogenic activities, and 6) environmental data. Where appropriate, data will be available in standard GIS format. Data safeguards and sharing agreements will be developed and taken into account.
- **implementation-timeline:** Begin design of web-based site immediately with establishment of a live URL launched as soon as possible.

ACTORS

- **responsible for co-ordination of action:** Conservation Plan Co-ordinator.
- **stakeholders:** Range State Governments, IUCN, IWC, industry, local authorities, NGOs.

ACTION EVALUATION

- IWC
- IUCN

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION PACB-01: DEVELOP A STRATEGY TO INCREASE PUBLIC AWARENESS AND BUILD CAPACITY IN RANGE STATES

Public Awareness and Capacity Building Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** To develop a strategy specific to each range State for the timely production of a series of resources to inform citizens of range states of the status of western gray whales and what they should do if they see animals either at sea or stranded.
- **rationale:** It is extremely difficult to obtain information on western gray whales away from the known concentrations on the feeding grounds, given the small total number of animals and the lack of information on migration routes and on the location of breeding grounds (see Action RES-01). Without further information, traditional research methods such as sightings surveys will be ineffective (as well as prohibitively expensive). However, in much of their suspected range, western gray whales would have to be in waters with considerable marine traffic (*e.g.* fisheries, cargo, public transport, military, marine industry, research, pleasure). They may occur on (if stranded) or near heavily populated coastlines. The value of opportunistic observations should be maximised using the variety of communication techniques available, including the internet, newspapers, radio and television. The information obtained will be of direct value to conservation efforts in a number of ways.
- **target:** To develop a strategy and Actions to produce a variety of targeted, accurate, public awareness resources that will inform people on the status of western gray whales and on how citizens can assist in conservation efforts including what they should do if they encounter living or dead western gray whales. ‘Targeted’ refers to a variety of categories of persons (there will be overlap), to be determined but certainly including, for each range state: mariners (and their trade associations where applicable), fishermen (and their trade associations where applicable), whalewatching operations, NGOs, research institutes, schools. Such efforts will need oversight by the Co-ordinator and Steering Committee such that local differences are accounted for but ensuring overall consistency and accuracy. The Conservation Plan website and central database(s) will play an important role (see Actions CORD-01 and CORD-02).
- **timeline:**

| | WHAT | WHO | WHEN |
|-----|--|---|------------------|
| (1) | Preparation for a small expert workshop to develop a strategy for the public awareness effort | Interim Steering Committee (ISC) – see Action CORD-01 | December 2010 |
| (2) | Hold workshop | Identified participants (see methods below) | March 2011 |
| (3) | Implement strategy and actions agreed by workshop following a timeline established by the workshop (probably a staged process) | Workshop, Co-ordinator of Conservation Plan | To be determined |

- **methods:** The ISC begin preparations for a small expert workshop to determine the strategy for public awareness materials, including:

- Identification of target groups, by range state where appropriate.
- Identification of existing/development of new text, audio and visual material to provide general background to the situation of western gray whales; consideration should be given to how this material may need to be varied for any of the target groups.
- Identification of existing/development of new text, audio and visual material to provide information on what to do if one encounters a living or dead animal; consideration should be given to how this material may need to be varied for any of the target groups, taking into account Actions MIT-01 and MIT-02.
- Identify/ensure that mechanisms are in place to receive, review and incorporate information (data, photos, tissues etc.) for maximum conservation benefit, taking into account Actions CORD-01 and CORD-02.
- Determine a mechanism to ensure that the general objective/target is met in as timely a fashion as possible, including specific actions, a budget and a timeline.
- attendees should include:
 - Co-ordinator of the Conservation Plan and representatives of the stakeholder Steering Committee.
 - Scientists familiar with the western gray whale situation.
 - Scientists familiar with incorporating data from the general public – e.g. IWC ship strikes project (http://www.iwcoffice.org/sci_com/shipstrikes.htm).
 - Public awareness experts from each country.

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

Costs associated with preparatory materials and holding of a workshop in December 2010.

ACTORS

- **responsible for co-ordination of the action:** The ISC to prepare for the holding of the workshop, subsequently the Co-ordinator and broader stakeholder Steering Committee for the Conservation Plan.
- **responsible for carrying out the action:** To be determined at workshop.
- **stakeholders:** All

ACTION EVALUATION

- IUCN, IWC.
- Feedback system built in to materials.

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION RES-01: DETERMINE MOVEMENTS, MIGRATION ROUTES AND LOCATION OF WINTERING GROUND(S) THROUGH SATELLITE TELEMETRY

Research Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** determine western gray whale movements, migration routes and location of the wintering ground(s). Specifically, this work is intended to:
 - Determine the migratory timing and routes between summer feeding and winter breeding areas.
 - Improve the ability to assess potential threats along the migration routes and identify areas where mitigation is most critically needed.
 - Identify winter breeding area(s) so that potential threats there can be identified and mitigated.
 - Improve understanding of the movements of western gray whales between and among feeding habitats in the expectation that this would (i) lead to more photographic identifications of whales in feeding areas other than those off Sakhalin and Kamchatka, allowing improved population assessment, and (ii) point to additional areas in need of protection from potentially harmful human activities.
- **specific threats to be mitigated:** To be determined by combining telemetry-derived movement data with spatial information on threat factors such as set nets, other types of fishing gear and oil spills (see RES-02, RES-03 and RES-04).
- **rationale:** Detailed knowledge concerning the movements, migration route(s), wintering area(s) and summering areas of western gray whales is needed so that appropriate mitigation measures to minimize threats to the population can be designed and implemented. These information gaps highlight the need for telemetry work to be carried out.
- **target:** To gain a good understanding of the movements, migration routes and location of the wintering ground(s) and, where possible, combine telemetry data with information on threat factors such as fishing, shipping and industrial operations by February 2011.
- **method:** Satellite telemetry, following advice, guidance and safeguards provided by IWC SC co-ordination group (see Weller *et al.* 2009).
- **implementation-timeline:** Field programme to be completed by September 2010 with an initial progress report available by December 2010 and interim report by June 2011.

ACTORS

- **responsible for co-ordination of action:** IWC; IUCN.
- **stakeholders:** Range State Governments, IUCN, IWC, industry, local authorities, NGOs.

ACTION EVALUATION

- IWC
- IUCN

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION RES-02: DEVELOPMENT OF A GIS DATABASE ON LOCATIONS OF SET NETS (BOTH SMALL-TYPE AND LARGE-TYPE) IN THE RANGE OF WESTERN GRAY WHALES

Research Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objectives:** To identify areas where the risk of gray whale entrapment in set nets is high.
- **specific threats to be mitigated:** Set net entrapment.
- **rationale:**
 - Five gray whales (all female) were caught or found dead on the Pacific coast of Japan during 2005-2007, including four deaths in set nets.
 - In an example scenario, projections of the female population incorporating the same level of 'extra' mortality (5 females per 3 years), on the assumption that all dead individuals are from the population that feeds off Sakhalin and are not included in the estimated background level of 'natural' mortality, indicated a high probability (~25%) of population decline and a substantial risk (~10%) of extirpation by 2050.
 - An initial component of addressing the entrapment problem is to develop a GIS database containing locations of set nets of the kind known to catch whales.
 - Ultimately, the set net data should be combined with information on gray whale movements (*e.g.* from satellite tagging – RES-01) in order to identify areas of overlap where mitigation measures (*e.g.* entrapment prevention – MIT-02; live release; MIT-01) should be applied.
- **target:** To have a comprehensive GIS database on locations of set nets in the range states of gray whales operational by July 2011.
- **method:** Relevant authorities in the range states will be requested to provide the information, if possible in electronic format. In the event that the data are not already available in electronic format, a data-coding component will be necessary prior to entry into the GIS system.
- **implementation timeline:** Work should begin immediately with the expectation that a functioning GIS database will be available by July 2011.

ACTORS

- **responsible for co-ordination of action:** Initially IUCN, then Co-ordinator/Steering Committee of Conservation Plan.
- **stakeholders:** Range State Governments, IWC, IUCN, fisheries, local authorities, NGOs.

ACTION EVALUATION

- Co-ordinator/Steering Committee of Conservation Plan.
- IWC

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION RES-03: DEVELOPMENT OF A GIS DATABASE ON LOCATIONS OF GILL NETS AND POT/TRAP GEAR (E.G. FOR CRABS) IN THE RANGE OF WESTERN GRAY WHALES

Research Action

Priority: **MODERATE-HIGH**

DESCRIPTION OF ACTION

- **specific objectives:** To identify areas where the risk of gray whale entanglement in gill nets and pot/trap gear is high.
- **specific threats to be mitigated:** Entanglement in gill nets, pot/trap lines and other related fishing gear.
- **rationale:**
 - Entanglement of western gray whales in fishing gear other than set nets (*e.g.* gill nets, buoy lines of pot/trap gear) is documented from the relatively high rates of scarring and wounding on whales photographed off Sakhalin Island.
 - An initial component of understanding and addressing the entanglement problem is to develop a GIS database containing locations of large-mesh gill nets and pot/trap gear (*e.g.* for crabs) of the kind known to entangle whales.
 - Ultimately, these data, like the set net data, will be combined with information on gray whale movements (*e.g.* from satellite tagging – RES-01) in order to identify areas of overlap where mitigation measures should be applied.
- **target:** To have a comprehensive GIS database on locations (or at least general areas) where gill nets and pot/trap gear are deployed in the range of western gray whales operational by December 2011.
- **method:**
 - This will be a focused effort based on the initial telemetry results (see RES-01).
 - It will be initiated only after at least preliminary data are available from the telemetry work planned for late summer and autumn 2010.
 - Because gill nets and pot/trap gear differ from set nets in that they are not deployed at fixed locations through time, it may prove necessary to collect and organise these data somewhat differently than the set net data.
 - Relevant authorities in Japan and the other range states will be requested to provide the information, if possible in electronic format. In the event that the data are not already available in electronic format, a data-coding component will be necessary.
 - Data will also be collected on types of fishing gear that has entangled eastern gray whales and details on any releases
- **implementation-timeline:** Work should begin as soon as the necessary telemetry data are available and a functioning database should be available within one year after project initiation, *i.e.* by December 2011.

ACTORS

- **responsible for co-ordination of action:** Co-ordinator/Steering Committee of Conservation Plan.
- **stakeholders:** Range State Governments, IWC, IUCN, fisheries, local authorities, NGOs.

ACTION EVALUATION

- Co-ordinator/Steering Committee of Conservation Plan.
- IWC

PRIORITY

- **importance:** Moderate-High
- **feasibility:** Moderate-High



ACTION RES-04: IDENTIFYING AREAS WHERE WESTERN GRAY WHALES HAVE A HIGH RISK OF BEING EXPOSED TO OIL SPILLS

Research Action

Priority: **MODERATE-HIGH**

DESCRIPTION OF ACTION

- **specific objectives:** To identify areas where there is high risk of gray whales being exposed to oil spills throughout their range.
- **specific threats to be mitigated:** Direct exposure of gray whales to oil spills.
- **rationale:**
 - The direct effects of oil spills on gray whales involve contact between the oil and the whale, potentially leading to skin damage, fouling of baleen, damage to pulmonary tissue from inhalation of volatile components, and toxicity resulting from ingestion.
 - There is some possibility that whales would be able to detect and avoid concentrations of oil on the surface or in the water column, but it cannot be assumed that they will. What little evidence there is (see Reeves *et al.* 2005) suggests that gray whales do not exhibit a strong or effective avoidance response upon encountering surface oil slicks.
 - The risk of exposure to spilled oil has been assessed specifically with reference to the oil being extracted from the Sakhalin Shelf and transported away from Sakhalin Island by one of the companies operating there (Sakhalin Energy) (see Reeves *et al.* 2005 and WGWAP reports) but no similar assessments are available for other oil and gas projects in that region. Nor has there been an assessment of the risk to western gray whales from oil spills in their migration routes and wintering area(s), including tanker spills of crude oil and spills of fuel oil from all types of vessels. Such assessments are needed before mitigation action can be planned.
- **target:** To have ready by December 2011 a comprehensive overview of areas where the risk of gray whale exposure to oil spills is high.
- **method:**
 - This will be a focused effort based on the initial telemetry results (see RES-01).
 - Once information on gray whale movements becomes available, it will be combined with information on the location of offshore oil production facilities, tanker traffic corridors and shipping lanes generally, with particular attention to sites where the risk of spills is judged to be high. Risk analyses will then be carried out to identify areas of spatial and temporal overlap where mitigation measures should be applied.
 - Japan, the Republic of Korea and the People's Republic of China are signatories to the International Convention on Oil Pollution Preparedness, Response and Co-operation (see Annex 1) and are expected to have identified high-risk areas for oil spills, which can be used in this Action.
- **implementation-timeline:** Work should begin as soon as the necessary telemetry data are available and an overview of oil spill risk areas for western gray whales should be available within one year after project initiation, *i.e.* by December 2011.

ACTORS

- **responsible for co-ordination of action:** Co-ordinator/Steering Committee of Conservation Plan.
- **stakeholders:** Range State Governments, IWC, IUCN, fisheries, local authorities, NGOs.

ACTION EVALUATION

- Co-ordinator/Steering Committee of Conservation Plan.
- IWC

PRIORITY

- **importance:** Moderate-High
- **feasibility:** Moderate-High

ACTION MON-01: ENSURE LONG-TERM MONITORING OF ABUNDANCE AND TRENDS OFF SAKHALIN ISLAND THROUGH PHOTO-IDENTIFICATION AND BIOPSY SAMPLING

Monitoring Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** Ensure that annual monitoring of abundance and trends, through photo-identification and genetic biopsy sampling, is conducted off Sakhalin Island at an appropriate level.
- **specific threats to be mitigated:** While not a mitigation action *per se*, this action will provide an integrated picture as to whether mitigation measures appear to be working and may also provide some insight into areas where additional mitigation measures may be needed.
- **rationale:** Continued monitoring of the population and regular updates of a population assessment (*e.g.* see Cooke *et al.* 2008) are essential for meeting conservation objectives. Any adverse demographic changes, should they occur, must be detected as soon as possible so that remedial actions can be taken. A power analysis will be needed to determine the scale of photo-identification effort, in terms of both days in the field and time interval between surveys, needed to detect any alarming change in abundance, calf production or trend for this population. An additional attribute that should continue to be monitored is body condition of individual whales in the feeding areas. A long time series of individual-animal data collected in the Sakhalin feeding areas is already available and this creates the possibility of detecting changes in condition (a potential proxy for animal health or quality of foraging habitat) over time.
- **target:** Collection of photographic, body condition and genetic data on an annual basis beginning summer 2011.
- **method:**
 - Power analysis of existing data to determine necessary level of sampling.
 - Photo-identification and genetic biopsy sampling to determine abundance and trends.
 - Analysis of trends in body condition over time.
- **implementation-timeline:** Field programme(s) to be conducted annually beginning in 2011.

ACTORS

- **responsible for implementation of action:** Co-ordinator of Conservation Plan.
- **stakeholders:** Range State Governments, IUCN, IWC, industry, local authorities, NGOs.

ACTION EVALUATION

- IWC
- IUCN

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION MON-02: ENSURE LONG-TERM MONITORING OF DISTRIBUTION, ABUNDANCE AND TRENDS OFF SOUTH-EASTERN KAMCHATKA

Monitoring Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** Ensure that annual monitoring of whale distribution, abundance and trends is conducted off south-eastern Kamchatka.
- **specific threats to be mitigated:** This action will provide an important aspect of an integrated picture of range contraction or expansion.
- **rationale:** Continued monitoring of whale distribution as a population attribute is essential for meeting conservation objectives, since whale distribution may reflect range contraction or expansion, responses to deteriorating or improving conditions in feeding or calving areas, or increased or decreased abundance. In this regard, continued monitoring of gray whales in the bays off south-eastern Kamchatka is a high priority. An additional attribute that should be monitored is body condition of individual whales. A long time series of individual-animal data collected in the Sakhalin feeding areas is already available and this creates the possibility of detecting changes in condition (a potential proxy for animal health or quality of foraging habitat) over time.
- **target:** Collection of photographic, body condition and genetic data on an annual basis beginning summer 2011.
- **method:**
 - Surveys of bays off south-eastern Kamchatka including photo-identification and genetic biopsy sampling to determine abundance and trends.
 - Analysis of trends in body condition over time.
- **implementation-timeline:** Field programme(s) to be conducted annually beginning in 2011.

ACTORS

- **responsible for implementation of action:** Co-ordinator of Conservation Plan.
- **stakeholders:** Range State Governments, IUCN, IWC, industry, local authorities, NGOs.

ACTION EVALUATION

- IWC
- IUCN

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION MIT-01: RELEASE OF GRAY WHALES ENTRAPPED IN SET NETS

Mitigation Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** To release alive and unharmed all gray whales entrapped in set nets.
- **specific threats to be mitigated:** All mortality of gray whales related to entrapment in set nets.
- **rationale:**
 - Five gray whales (all female) were caught or found dead on the Pacific coast of Japan during 2005-2007, including four deaths in fishing nets.
 - In an example scenario, projections of the female population incorporating the same level of 'extra' mortality (5 females per 3 years), on the assumption that all dead individuals are from the population that feeds off Sakhalin and are not included in the estimated background level of 'natural' mortality, indicated a high probability (~25%) of population decline and a substantial risk (~10%) of extirpation by 2050.
 - A precautionary approach is therefore to eliminate or at least reduce as far as possible mortality related to entrapment in set nets.
 - Gray whales entrapped in set nets are usually alive and uninjured, and thus live release would be feasible in many cases.
- **target:** By December 2011 relevant fishermen have received training in methods for whale release and a system for notification, co-ordination and follow-up of release efforts is in place.
- **method:**
 - A survey is conducted by a team of gear technologists of the various types of set nets in use within the expected range of the western gray whale, taking into account existing reviews of these net types.
 - The survey will result in a detailed description of the various set net types with emphasis on differences that are important for release of whales from the nets and on the feasibility of developing methods for releasing whales.
 - Methods for release of gray whales from each type of set net will be developed and tested in cooperation with set net cooperatives, fishermen and fisheries authorities.
 - Once these methods are developed and tested, a campaign will be initiated to train cooperatives in release methods; these will include collection of tissue samples and identification photos; at a later time further developments of telemetry methods could mean that attachment of tags to released animals may be considered.
 - Training will be accompanied by public and targeted awareness/education campaigns (see PACB-01).
- **implementation-timeline:**
 - Survey conducted in April 2011.

- Description available by May 2011.
- Development and testing in June 2011.
- Training workshops in autumn 2011.

ACTORS

- **responsible for co-ordination of action:** Co-ordinator of Conservation Plan.
- **responsible for implementation of action:** Range State Governments (probably fisheries agencies).
- **stakeholders:** Fishermen, fisheries authorities, NGOs.

ACTION EVALUATION

- Co-ordinator/Steering Committee of Conservation Plan.
- IWC

PRIORITY

- **importance:** High
- **feasibility:** High

ACTION MIT-02: PREVENTION OF ENTRAPMENT OF GRAY WHALES IN SET NETS

Mitigation Action

Priority: **HIGH**

DESCRIPTION OF ACTION

- **specific objective:** To prevent entrapment of gray whales in set nets.
- **specific threats to be mitigated:** Mortality of gray whales as a result of entrapment in set nets.
- **rationale:**
 - Five gray whales (all female) were caught or found dead on the Pacific coast of Japan during 2005-2007, including four deaths in fishing nets.
 - In an example scenario, projections of the female population incorporating the same level of 'extra' mortality (5 females per 3 years), on the assumption that all dead individuals are from the population that feeds off Sakhalin and are not included in the estimated background level of 'natural' mortality, indicated a high probability (~25%) of population decline and a substantial risk (~10%) of extirpation by 2050.
 - A precautionary approach is therefore to eliminate or at least reduce as far as possible mortality related to entrapment in set nets.
 - Prevention of entrapment reduces the mortality risk to the whales.
 - In principle, it should be feasible to exclude gray whales from set nets without compromising the efficiency of target species capture.
- **target:** By December 2011 methods for prevention of gray whale entrapment are introduced in the set net fisheries.
- **method:**
 - Produce a detailed description of the various types of set nets in use within the expected range of the western gray whale, with emphasis on differences that are important for prevention of entrapment in set nets (co-ordinate with MIT-01).
 - A team of gear technologists will evaluate the feasibility of developing and testing gear modification methods for prevention of gray whale entrapments in cooperation with set net cooperatives, fishermen and fisheries authorities.
 - If judged feasible, methods for prevention of gray whale entrapments will be developed and tested in cooperation with set net cooperatives, fishermen and fisheries authorities.
 - Following that, a campaign will be initiated to train cooperatives in methods for prevention of gray whale entrapments.
 - Training will be accompanied by public and targeted awareness/education campaigns (see PACB-01).
 - Legislative or regulatory action will be introduced if needed.
- **implementation-timeline:**
 - Description available by May 2011.
 - Development and testing in June-July 2011.

- Information campaigns and workshops held in August-September 2011.
- Legislation or regulatory changes should be evaluated by August 2011 and, if deemed necessary, accomplished by December 2011.

ACTORS

- **responsible for co-ordination of action:** Co-ordinator of Conservation Plan.
- **responsible for implementation of action:** Range State Governments (probably fisheries agencies).
- **stakeholders:** Fishermen, fisheries authorities, NGOs.

ACTION EVALUATION

- Co-ordinator/Steering Committee of Conservation Plan.
- IWC

PRIORITY

- **importance:** High
- **feasibility:** High

9 REFERENCES

- Baird R.W., Stacey, P.J., Duffus, D.A. and Langelier, K.M. 2002. An evaluation of gray whale (*Eschrichtius robustus*) mortality incidental to fishing operations in British Columbia, Canada. *J. Cetacean Res. Manage.* 4(3):289–296.
- Bradford, A.L., Wade, P.R., Weller, D.W., Burdin, A.M., Ivashchenko, Y.V., Tsidulko, G.A. and Brownell, R.L., Jr. 2006. Survival estimates of western gray whales (*Eschrichtius robustus*) incorporating individual heterogeneity and temporary emigration. *Marine Ecology Progress Series* 315:293-307
- Bradford, A.L., Weller, D.W., Ivashchenko, Y.V., Burdin, A.M. and Brownell, R.L., Jr. 2009. Anthropogenic scarring of western gray whales (*Eschrichtius robustus*). *Marine Mammal Science.* 25(1):161-175.
- Brownell, R.L., Jr. and Kasuya, T. 1999. Western gray whale captured off western Hokkaido, Japan. Paper SC/51/AS25 presented to the Scientific Committee of the International Whaling Commission. Available from: IWC Secretariat, Cambridge, UK.
- Cooke, J.G., Weller, D.W., Bradford, A.L., Burdin, A.M. and Brownell, R.L., Jr. 2008. Population assessment of western gray whales in 2008. Paper SC/60/BRG11 presented to the Scientific Committee of the International Whaling Commission. Available from: IWC Secretariat, Cambridge, UK.
- Donovan, G. 2005. Cetaceans: can we manage to conserve them? The role of long-term monitoring. pp.161-74. *In: Solbé, J. (eds). Long-term Monitoring - why, what, where, when and how?* Sherkin Island Marine Station, Sherkin Island, Co. Cork, Ireland. 226pp.
- Donovan, G., Cañadas, A. and Hammond, P. 2008. Towards the development of effective conservation plans for cetaceans. Paper SC/60/O17 presented to the Scientific Committee of the International Whaling Commission. Available from: IWC Secretariat, Cambridge, UK.
- Henderson, D. 1990. Gray whales and whalers on the China coast in 1869. *Whalewatcher* 24(4):14-16.
- Heyning, J.E. and Lewis, T.D. 1990. Entanglements of baleen whales in fishing gear off southern California. *Rep. int. Whal. Commn* 40:427-431.
- Johnson, A., Salvador, G., Kenney, J., Robbins, J., Kraus, S., Landry, S. and Clapham, P. 2005. Analysis of fishing gear involved in entanglements of right and humpback whales. *Mar. Mammal Sci.* 21:635-645
- Johnson, S.R., Richardson, W.J., Yazvenko, S.B., Blokhin, S.A., Gailey, G., Jenkerson, M.R., Meier, S.K., Melton, H.R., Newcomer, M.W., Perlov, A.S., Rutenko, S.A., Würsig, B., Martin, C.R. and Egging, D.E. 2007. A western gray whale mitigation and monitoring program for a 3-D seismic survey, Sakhalin Island, Russia. *Environ. Monit. Assess.* 134:1-19
- Kato, H., et al. 2008. Current status of vessel collision with cetacean in coast waters off Japan. Paper RW2008-16 presented to the IUCN Western Gray Whale Rangewide workshop, Tokyo, September 2008.
- Krahn, M.M., Ylitalo, G.M., Burrows, D.G., Calambokidis, J., Moore, S.E., Gosho, M., Gearin, P., Plesha, P.D., Brownell, R.L., Jr., Blokhin, S.A., Tilbury, K.L., Rowles, T. and Stein, J.E. 2001. Organochlorine contaminant concentrations and lipid profiles in eastern North Pacific gray whales (*Eschrichtius robustus*). *J. Cetacean Res. Manage.* 3(1):19-29.
- Lang, A.R., Weller, D.W., Burdin, A.M. and Brownell, R.L., Jr. 2008. Population structure of western gray whales: Insight from genetic analyses. Paper RW2008-1 presented to the IUCN Western Gray Whale Rangewide workshop, Tokyo, September 2008.

- Lang, A.R., Weller, D.W., LeDuc, R.G., Burdin, A.M. and Brownell, R.L., Jr. 2010. Genetic differentiation between western and eastern (*Eschrichtius robustus*) gray whale populations using microsatellite markers. Paper SC/62/BRG11 presented to the IWC Scientific Committee of the International Whaling Commission, Agadir, June 2010. Available from: IWC Secretariat, Cambridge, UK.
- LeDuc, R.G., Weller, D.W., Hyde, J., Burdin, A.M., Rosel, P.E., Brownell, Jr., R.L., Würsig, B. and Dizon A.E. 2002. Genetic differences between western and eastern gray whales (*Eschrichtius robustus*). *J. Cetacean Res. Manage.* 4(1):1-5.
- O’Shea, T.J. and Brownell, R.L., Jr. 1994. Organochlorine and metal contaminants in baleen whales: a review and evaluation of conservation implications. *The Science of the Total Environment* 154:179-200.
- Read, A.J., Drinker, P. and Northridge, S.P. 2006. Bycatch of Marine Mammals in U.S. and Global Fisheries. *Conservation Biology* Vol. 20(1): 163–169.
- Reeves, R.R., Brownell, R.L., Jr., Burdin, A., Cooke, J.G., Darling, J.D., Donovan, G.P., Gulland, F., Moore, S.E., Nowacek, D.P., Ragen, T.J., Steiner, R., VanBlaricom, G., Vedenev, A. and Yablokov, A.V. 2005. Report of the Independent Scientific Review Panel on the impacts of Sakhalin II Phase 2 on western North Pacific gray whales and related biodiversity. IUCN–The World Conservation Union, Gland, Switzerland. 123 pp.
- Stevens, L. and Aurand, D. 2008. Criteria for Evaluating Oil Spill Planning and Response Operations. A Report to IUCN. Ecosystem Management & Associates, Inc., Lusby, MD. 20657. Technical Report 07-02 (Revised June 2008), 55p.
- Weller, D.W., Burdin, A.M., Würsig, B., Taylor, B.L. and Brownell, R.L., Jr. 2002. The western gray whale: a review of past exploitation, current status and potential threats. *J. Cetacean Res. Manage.* 4(1):7-12.
- Uni, Y. and Kasuya, T. 2002. Review of historical records of gray whales in Japanese waters. Paper SC/02/WGW15 presented to the IWC Scientific Committee of the International Whaling Commission. Available from: IWC Secretariat, Cambridge, UK.
- Weller, D.W., Bradford, A.L., Kato, H., Bando, T., Ohtani, S., Burdin, A.M. and Brownell, R.L., Jr. 2008. Photographic match of a western gray whale between Sakhalin Island, Russia, and Honshu, Japan: First link between feeding ground and migratory corridor. *J. Cetacean Res. Manage.* 10(1):89-91.
- Weller, D., Brownell, R.L., Jr., Burdin, A., Donovan, G., Gales, N., Larsen, F., Reeves, R. and Tsidulko, G. 2009. A proposed research programme for satellite tagging western gray whales in 2010. Paper SC/61/BRG31 presented to the Scientific Committee of the International Whaling Commission. Available from: IWC Secretariat, Cambridge, UK.
- WGWAP. 2006. Report of the Western Gray Whale Advisory Panel at its first meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Prangins, Switzerland 42 pp.
- WGWAP. 2007a. Report of the Western Gray Whale Advisory Panel at its second meeting. Unpublished report, <http://www.iucn.org/wgwap/>, St. Petersburg, Russia, 52 pp.
- WGWAP. 2007b. Report of the Western Gray Whale Advisory Panel at its third meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Lausanne, Switzerland, 65 pp.
- WGWAP. 2008. Report of the Western Gray Whale Advisory Panel at its fourth meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Lausanne, Switzerland, 58 pp.
- WGWAP. 2009a. Report of the Western Gray Whale Advisory Panel at its fifth meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Lausanne, Switzerland, 51 pp.
- WGWAP. 2009b. Report of the Western Gray Whale Advisory Panel at its sixth meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Geneva, Switzerland, 47 pp.

WGWAP. 2010. Report of the Western Gray Whale Advisory Panel at its seventh meeting. Unpublished report, <http://www.iucn.org/wgwap/>, Lausanne, Switzerland, 42 pp.

Würsig, B., Weller, D.W., Burdin, A.M., Blokhin, S.A., Reeve, S.H., Bradford, A.L. and Brownell, R.L. Jr. 2000. Gray whales summering off Sakhalin Island, Far East Russia: July-September 1998. A joint U.S.-Russian scientific investigation. Final contract report to Sakhalin Energy Investment Company and Exxon Neftegas. 133 pp.

Zhou, K. and Wang, X. 1994. Brief review of passive fishing gear and incidental catches of small cetaceans in Chinese waters. *Rep. Int. Whal. Commn Spec. Issue* 15:347-354.



ANNEX 1

Annex 1 includes a summary of information on relevant international conventions and agreements, and on relevant national legislation. A more detailed treatment of this will be available from the Western Gray Whale Rangewide Conservation Plan webpage, once this has been established.

1 INTERNATIONAL CONVENTIONS AND AGREEMENTS

1.1 INTERNATIONAL CONVENTION FOR THE REGULATION OF WHALING

The **International Convention for the Regulation of Whaling** (ICRW) was adopted on 2 December 1946. It established the International Whaling Commission (IWC) to ensure the proper and effective conservation and development of whale stocks by regulating whaling activities. As of 1 June 2009, with the exception of the Democratic People's Republic of Korea, all the other range states were members of the IWC. Since the 1985/1986 season, commercial takes of all large whales have been suspended and catch limits set for only aboriginal subsistence whaling. Eastern gray whales, classified as a Sustained Management Stock, can be harvested for aboriginal subsistence in Chukotka, Russian Federation, and in Washington State, USA. In contrast, any type of commercial or aboriginal whaling on western gray whales, classified as a Protection Stock, is suspended.

1.2 CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS

The **Convention on the Conservation of Migratory Species of Wild Animals** (CMS), also known as the **Bonn Convention**, is an intergovernmental treaty under the auspices of the United Nations Environment Programme. It aims to "...conserve terrestrial, marine and avian migratory species throughout their range". None of the range states of western gray whales are members of the CMS. However, the People's Republic of China and the Russian Federation participate in some Memoranda of Understanding under the convention. Appendix I of the Convention is a list of endangered migratory species that are threatened with extinction while Appendix II is a list of migratory species that need or would significantly benefit from international co-operation. State parties are required to protect species listed in Appendix I by conserving and restoring their habitat, mitigating obstacles to their migration and controlling factors that can endanger them. The Convention promotes the development of agreements that will benefit species listed in Appendix II. The gray whale is not listed in either Appendix I or Appendix II.

1.3 CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

The **Convention on International Trade in Endangered Species of Wild Fauna and Flora** (CITES) was agreed at a meeting of representatives of 80 countries in Washington DC., United States of America, on 3 March 1973, and on 1 July 1975 CITES entered into force. The purpose of the convention is to protect endangered animals and plants from over-exploitation by regulating international trade. All range states of western gray whales except the Democratic People's Republic of Korea are members of CITES. Endangered species threatened with extinction are listed in Appendix I of the Convention. International trade of these species is prohibited except for non-commercial uses where it can be shown that

limited and well-documented trade represents no risk to the species (e.g. scientific research). The gray whale is listed in Appendix I.

1.4 INTERNATIONAL MARITIME ORGANISATION

The **International Maritime Organisation (IMO)** was established on 6 March 1948 with the mandate to “...develop and maintain a comprehensive regulatory framework for shipping...” as well as to prevent and control marine pollution from ships. All western gray whale range states are members. The IMO has spawned a number of international conventions intended to regulate or prevent impacts of shipping activities on the marine and coastal environment as well as insure people’s safety:

The **Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter**, generally known as the **London Convention**, was adopted on 29 December 1972. It was replaced on 17 November 1996 by the **Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter**, also known as the **London Protocol**. This protocol aims to protect the marine environment from human activities and defines the global rules and regulations on dumping. With the exception of the Democratic People’s Republic of Korea, all other range states are members. Among them, only the People’s Republic of China (1998), Japan (2007) and the Republic of Korea (2009) have signed the London Protocol. The London Protocol promotes waste management by regulating and preventing dumping activities.

The **International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)** came into force on 2 October 1983. Among the range states, only the People’s Republic of China, Japan, and the Republic of Korea have signed all MARPOL Annexes. The Democratic People’s Republic of Korea and the Russian Federation agreed to all except MARPOL Annex VI on the prevention of air pollution from ships. This Convention acts to prevent accidental and operational pollution of the marine environment resulting from shipping activities. It incorporates most of the articles of the **International Convention for the Prevention of Pollution of the Sea by Oil**, also known as OILPOL, adopted in 1954. MARPOL 73/78 explicitly provides regulations for oil, chemicals, harmful substances in packaged form, sewage and garbage pollution. Under this agreement, ships are required to have double hulls, ballast tanks and other appropriate equipment to prevent or limit pollution and discharges at sea. The Convention also designates special areas where dumping and pollution are strictly prohibited.

The **International Convention on Oil Pollution Preparedness, Response and Co-operation**, known as the **OPRC Convention**, was adopted on 30 November 1990. It promotes international co-operation and mutual assistance for preparation and response to oil pollution incidents. It also encourages members to develop and maintain an adequate capability to deal with oil pollution emergencies. Among the range states, only Japan, the Republic of Korea and the People’s Republic of China have signed this convention.

1.5 REGIONAL FISHERIES BODIES

The **Asia-Pacific Fishery Commission** was established by FAO in 1948 to “...improve understanding, awareness and cooperation in fisheries issues in the Asia-Pacific region”. Member countries of this Commission include the People’s Republic of China, Japan and the Republic of Korea.

The **Association of Southeast Asian Nations (ASEAN)** was established on 8 August 1967. The **ASEAN Fisheries Federation (AFF)** promotes and coordinates all activities relating to fisheries and fisheries-based products. The Constitution of the ASEAN Fisheries Federation

forms the basic framework for administration and operation. The AFF is currently involving a number of fishery issues, particularly in relation to trade and export of fish and fishery products.

The **Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean** was adopted in 2000 with the aim to "...ensure through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the Western and Central Pacific Ocean...". The Convention established the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, also referred to as the **Western and Central Pacific Fisheries Commission**. The People's Republic of China, Japan and the Republic of Korea are members.

1.6 RUSSIA-US BILATERAL AGREEMENT

The Agreement between the Government of the United States of America and the Government of the Russian Federation on Cooperation in the Field of Protection of the Environment and Natural Resources was signed in 1972 and renegotiated in 1994. It provides a framework for bilateral collaboration on relevant environmental issues. The U.S. Environmental Protection Agency and the Russian Ministry of Natural Resources are the lead agencies. Activities include exchanges of individual scientists and Working Group meetings. The U.S.-Russia Marine Mammal Working Group consists of around 40 scientists from both countries. Its programme includes cetacean (among which western gray whales), pinniped and sea otter research projects.

1.7 OTHER BODIES THAT MANAGE HUMAN ACTIVITIES IN THE MARINE ENVIRONMENT

The **United Nations Convention on the Law of the Sea (UNCLOS)** is a legal instrument defining the legal status of the different seas and straits as well as countries' limits, rights and duties within territorial seas. The convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. All western gray whale range states have ratified UNCLOS except the Democratic People's Republic of Korea, which signed the convention in 1982 but has not ratified it.

The **Convention on the Transboundary Movement of Hazardous Wastes**, known as the **Basel Convention**, controls the movement and disposal of hazardous wastes across nations.

The **North Pacific Marine Science Organisation (PICES)** aims to coordinate as well as promote the collection and exchange of marine scientific research in the North Pacific. The research is essentially directed towards assessing environmental changes in North Pacific ecosystems. Japan, the People's Republic of China, the Russian Federation and the Republic of Korea are members of PICES, which has an Advisory Panel on Marine Birds and Mammals.

The **Northwest Pacific Action Plan (NOWPAP)** was adopted in 1994 as a part of the Regional Seas Programme of the United Nations Environment Programme (UNEP). It aims to promote wise use, development and management of the coastal and marine environment of the north-western Pacific. The People's Republic of China, Japan, the Republic of Korea and the Russian Federation participate in this programme.

The **UNEP Global Program of Action for the Protection of the Marine Environment from Land-Based Activities** and the **Washington Declaration on Protection of the Marine Environment from Land-based Activities** were signed in 1995 by 109 governments, among

them Japan, the People's Republic of China, the Republic of Korea and the Russian Federation. This program stems from the 1982 UNCLOS and is meant to establish global and regional rules to prevent, reduce, control and eliminate the degradation of the marine environment from land-based activities and promote its recovery. It also promotes the sustainable use and conservation of marine living resources, ensures the protection of human health and maintains or restores the integrity and biodiversity of the marine environment.

2 NATIONAL LEGISLATION

The information on relevant national legislation presented in the following sections has been obtained from EcoLex (<http://www.ecolex.org>) and does not represent information provided by the individual nations listed hereunder. The information has not yet been checked by the respective national representatives except in the case of sections 2.3 A-D.

2.1 CHINA, PEOPLE'S REPUBLIC OF

A) National legislation with respect to direct exploitation of gray whales

The national authority for aquatic wildlife conservation in the People's Republic of China is the Department of Fishery Administration. This department is responsible for conducting surveys and listing wild aquatic animal species in need of special State or local protection.

The gray whale is classified as endangered by the People's Republic of China and listed as a wildlife species under special State second class protection. National Chinese regulations prohibit "the catching or killing of wild aquatic animal[s] under special protection by the State..." except when such catching or killing is deemed necessary, *e.g.* for scientific research. Under exceptional circumstances, a special license can be obtained from the Department of Fishery Administration. Chinese law further regulates the trade of endangered animals by prohibiting "the sale and purchase of wild aquatic animal[s] under special State protection or the products thereof...". When trade is considered necessary for special purposes such as scientific research, approval must be sought from the Department of Fishery Administration in the relevant province, autonomous region or municipality.

B) National legislation with respect to the bycatch of gray whales in fishing gear

Fisheries are regulated nationwide by the Department of Fishery Administration under the State Council. With respect to the bycatch of wildlife in fishing gear, Chinese law stipulates that any "wild aquatic animal caught by mistake in fishing operation should be freed at once without any condition".

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

There is no current national legislation on the prevention of and reporting of ship collisions with whales in the People's Republic of China.

D) National legislation with respect to the reporting and response to gray whale strandings

The State of the People's Republic of China owns the wildlife resources. With regard to the reporting and response to aquatic wildlife strandings, "...any injured, stranded or strayed wild aquatic animal ... should be promptly reported to the local department of fishery administration or their fishery superintendency agencies which shall take emergency measures to rescue...". When dead wild aquatic animals are found, they "...should be appropriately handled by the competent department of fishery administration".

E) National legislation with respect to habitat degradation and marine protected areas

Under Chinese law, everyone has an obligation to protect the environment. Nationwide prevention of pollution damage to the marine environment by land-source pollutants is the responsibility of the Environmental Protection Department. Marine pollution caused by fishing vessels outside of ports and by non-military vessels in fishing ports is handled by the competent State Administrative Department in charge of fisheries while pollution caused by non-military vessels is handled by the competent State Administrative Department in charge of Maritime Affairs. Marine pollution caused by military vessels is handled by the Environmental Protection Department of the Armed Forces.

The State Oceanic Administration of the People's Republic of China and its agencies are in charge of environmental protection with respect to oil and gas exploration and exploitation. Measures "...to prevent or minimise the damage to fishery resources" must be taken for underwater activities such as construction, exploration or explosions.

Chinese law prohibits "any damage to the living and breeding waters and areas or the living conditions of wild aquatic animal[s] under special protection by the State or local authorities..." and further bans "...all production activities that might adversely affect the breeding and subsistence..." of wild animals on the brink of extinction in their breeding grounds. The Department of Wildlife Administration at the various national administrative levels is responsible for monitoring the "... impact of the environment on wildlife ...".

According to the World Database on Protected Areas, there are 31 marine protected areas under national jurisdiction and 12 under international jurisdiction in the People's Republic of China (see Fig. 1).

Areas with "...representative natural ecosystems..." or with "...a natural concentrated distribution of rare and endangered wild animal[s]..." shall be established as nature reserves. In these, activities such as "...hunting, fishing ... and sand dredging..." are prohibited unless otherwise provided in the laws. "No production installations shall be built in the core area and buffer zone of nature reserves. In the experimental zone, no production installations that cause environmental pollution or do damage to the natural resources or landscapes shall be built". The Departments of Forestry, Agriculture, Geology and Mineral Resources, Water Conservancy, and Marine Affairs are responsible for nature reserves under their jurisdiction while the Department of Environmental Protection Administration is responsible for their nationwide integrated management. Zhuanghe, Dachangshan Island, Wangjia Island, Jin County, Huangcheng Island and Yantai in the Yellow and Bohai Seas (see Fig. 2) have been classified as ecologically important areas for western gray whales by the Chinese Mammal Taxonomic Group.

F) National legislation with respect to the permits to carry out relevant scientific research

Scientific research on "wild aquatic animal[s]" is encouraged and supported by the Government. This can be carried out in the experimental and buffer zones of nature reserves, but special approval is required from the Administrative Department of Nature Reserves when it is to be carried out in the core area of a reserve. Permits for scientific research in the People's Republic of China are issued by the Ministry of Agriculture.

2.2 TAIWAN, PROVINCE OF CHINA

A) National legislation with respect to direct exploitation of gray whales

There is no national legislation on whaling in Taiwan. The Council of Agriculture is the central government authority responsible for wildlife conservation. At local levels, municipal, city and county governments are the responsible wildlife conservation authorities. National law

protects endangered as well as rare or valuable endemic species from exploitation. Except under special circumstances such as for the purpose of academic research “...protected wildlife shall not be disturbed, ... hunted, killed...” and their products “...shall not be traded, exhibited, displayed, owned, imported, exported or processed...”. Only two cetaceans are on the list of protected species of Taiwan and the gray whale is not one of them.

B) National legislation with respect to the bycatch of gray whales in fishing gear

The Council of Agriculture of the Executive Yuan (the executive branch of the government) is responsible for managing fisheries in Taiwan. There is currently no national legislation on the bycatch of cetaceans in fishing gear in Taiwan.

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

There is currently no national legislation on the prevention and reporting of ship collisions with whales in Taiwan.

D) National legislation with respect to the reporting and response to gray whale strandings

Wildlife resources are considered public property. There is currently no national legislation on the reporting and response to whale strandings in Taiwan. According to the Wildlife Conservation Law, “if the carcass of a Protected Wildlife species is valuable for academic research ..., then academic or scientific research institutions ... may purchase it in priority from the owner or keeper”.

E) National legislation with respect to habitat degradation and marine protected areas

Under national law, everyone has the duty and responsibility to protect the environment. The Environmental Protection Administration, Executive Yuan, is the responsible authority for the purpose of the Marine Pollution Control Act. The Council of Agriculture of the Executive Yuan is responsible for the designation and establishment of “...aquatic organisms [sic] propagation and conservation zones”. Local authorities are in charge of establishing Wildlife Refuges in areas where wildlife habitat requires special conservation measures.

According to the World Database on Protected Areas, there are no marine protected areas around Taiwan (see Fig. 3).

F) National legislation with respect to the permits to carry out relevant scientific research

Protected wildlife may be “...disturbed, ... killed or otherwise utilized...” for the purpose of academic research, provided that prior approval has been received from the Council of Agriculture. Approval to carry out scientific research on protected species must be obtained from the central government authority.

2.3 JAPAN

A) National legislation with respect to direct exploitation of gray whales

The Ministry of the Environment (MoE) is responsible for the administration and management of wildlife while the Ministry of Agriculture, Forestry and Fisheries (MAFF) is in charge of the administration and management of most of aquatic wildlife. Direct exploitation of whales is regulated under two national laws: the Fisheries Law and the Fisheries Resources Protection Act. Under the Fisheries Law, three types of whaling operations are designated as whaling which needs permit of the Minister of Agriculture, Forestry and Fisheries: factory-ship type whaling, large-scale whaling and small-type whaling. No permit is currently issued for the factory-ship type and large-scale whaling, while permits are issued for small-type whaling only with respect to whale species not under

IWC's mandate, such as Baird's beaked whales and pilot whales. In addition, taking of gray whales as well as the sales and possession of their products has been prohibited under the Fisheries Resources Protection Act since January 1, 2009.

B) National legislation with respect to the bycatch of gray whales in fishing gears

Fisheries are regulated nationwide by the MAFF, and regionally by competent prefectural governments. Under the Fisheries Law, large whales incidentally caught in fishing nets have to be reported to the MAFF with information on date and place, species of by-caught, type of fishing operation and its permit/licence number, date and place of disposal, scientific data (length, weight and other biological features). DNA registry is also required. It is prohibited to sell any products derived from illegally caught whales, but by-caught whales may be sold and utilized if the by-caught animals are duly reported and registered with DNA profile. In April 2006 the Fisheries Agency of the MAFF issued an administrative guidance to the prefectures in which it requests concerned parties to release gray whales by-caught in set nets. Moreover, a ministerial ordinance under the Fisheries Resources Protection Law as amended in December 2008 prohibits taking of gray whales as well as the sales and possession of their products. This regulation entered into force on January 1, 2009.

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

There is currently no national legislation on the prevention and reporting of ship collisions with whales in Japan.

D) National legislation with respect to the reporting and response to gray whale strandings

Stranded or washed-ashore whales may be sold and utilized after the reporting to the MAFF is duly done, provided that the animals are dead or cannot survive, taking fully into account the hygienic aspect when utilizing them for food. In April 2006 the Fisheries Agency of the MAFF issued an administrative guidance to the prefectures in which it requests concerned parties to release gray whales stranded. Moreover, a ministerial ordinance under the Fisheries Resources Protection Law as amended in January 2008 prohibits the sales and possession of their products. This regulation entered into force on January 1, 2009.

E) National legislation with respect to habitat degradation and marine protected areas

Environmental conservation is inscribed in Japanese national law. The State has the responsibility to "...take necessary measures to conserve the marine environment including securing the biodiversity in the oceans...". It furthermore "...shall take necessary measures to promote projects for prevention of interference with environmental conservation... and protection and breeding of the endangered wildlife".

The Director-General of the Environment Agency is in charge of designating "...areas recognized as important for the conservation of the national endangered species of wild fauna and flora...".

According to the World Database on Protected Areas, Japan has a total of 136 marine protected areas under national jurisdiction and 13 under international jurisdiction (see, Fig. 4).

F) National legislation with respect to the permits to carry out relevant scientific research

National legislation encourages the improvement of scientific knowledge of the oceans as well as living aquatic resources and it is the State's responsibility to promote research and development in Japan. Generally speaking, some scientific research activities need to get permits from national/regional governments, while some do not. Taking of aquatic wildlife

(including whales) for the purposes of scientific research needs to obtain permits under the Fisheries Law to be carried out.

2.4 KOREA, PEOPLE'S REPUBLIC OF

A) National legislation with respect to direct exploitation of gray whales

There is no national legislation on whaling in the Republic of Korea. The State and local governments as well as the Minister of Environment have the responsibility to conserve and protect endangered and protected wildlife. Endangered wildlife species are protected in the Republic of Korea and classified under two categories: wildlife in the first class are in danger of extinction because of small population size while wildlife in the second class are in danger of extinction unless the threat level is reduced or eliminated. National legislation makes it illegal to “hunt, ... export, ... (including dead animals ...), ... or kill endangered wild fauna ..., and protected wild fauna ..., install ... nets ... to hunt or kill...” except under special circumstances, such as for academic research for which permission has been obtained from the Minister of Environment.

The presumed migratory route of western gray whales along the Kangwon, Kyongbuk and Kyonnam Provinces (see Fig. 5) in the People's Republic of Korea is protected as natural monument no. 126, known as *Ulsan Gray Whale Migration Waters*.

B) National legislation with respect to the bycatch of gray whales in fishing gears

Fisheries are regulated nationwide by the Ministry of Maritime Affairs and Fisheries. A national whale bycatch reporting system has been in place since 1996. Any bycatch event must be reported to the local authorities.

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

There is currently no national legislation on the prevention and reporting of ship collisions with whales in the Republic of Korea.

D) National legislation with respect to the reporting and response to gray whale strandings

A national whale stranding reporting system has been in place since 1996. Any stranding event must be reported to the local authorities.

E) National legislation with respect to habitat degradation and marine protected areas

Both the State and local governments “shall be liable to preserve the marine environments, marine resources and marine ecosystems”. The Minister of Environment is responsible for developing policies for the conservation of the natural environment, while the Minister of Maritime Affairs and Fisheries “shall establish and execute the comprehensive measures for the preservation of the marine environment...”.

The Minister of Environment is responsible for the designation and management of conservation areas, including areas “...where the existence of a species is threatened because of damage, deterioration, or isolation of major habitats of endangered wild fauna or flora, or areas which are of importance for migratory species”. Special protection areas for endangered wildlife are designated by Presidential Decree. “Practices of hunting or capturing, ... damaging, or killing wild [protected] fauna ...” are prohibited within conservation areas.

According to the World Database on Protected Areas, the People's Republic of Korea has a total of 9 marine protected areas under national jurisdiction and 1 under international jurisdiction (see Fig. 5).

F) National legislation with respect to the permits to carry out relevant scientific research

The Minister of Maritime Affairs and Fisheries is responsible for the promotion of international cooperation in marine scientific research. Permission for foreigners to carry out marine scientific research in and beyond the territorial sea of the Republic of Korea must be obtained from the Government of the Republic of Korea and a research plan must be submitted to the Minister of Maritime Affairs and Fisheries.

2.5 KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF**A) National legislation with respect to direct exploitation of gray whales**

No national legislation is available on the direct exploitation of whales from the Democratic People's Republic of Korea.

B) National legislation with respect to the bycatch of gray whales in fishing gears

No national legislation is available on the bycatch of whales in fishing gears from the Democratic People's Republic of Korea.

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

No national legislation is available on the prevention and the reporting of ship collisions with whales from the Democratic People's Republic of Korea.

D) National legislation with respect to the reporting and response to gray whale strandings

No national legislation is available on the reporting and response to whale strandings from the Democratic People's Republic of Korea.

E) National legislation with respect to habitat degradation and marine protected areas

No national legislation is available on habitat degradation and marine protected areas from the Democratic People's Republic of Korea.

According to the World Database on Protected Areas, the Democratic People's Republic of Korea does not have any marine protected areas under either national or international jurisdiction in its waters (see Fig. 5).

F) National legislation with respect to the permits to carry out relevant scientific research

No national legislation is available on the availability of research permit from the Democratic People's Republic of Korea.

2.6 RUSSIAN FEDERATION**A) National legislation with respect to direct exploitation of gray whales**

According to the Federal Law of the Russian Federation on Wildlife, marine mammals can be taken provided that the species targeted are not listed in the Red Data Book of the Russian Federation. Rare and endangered Red Data Book species are protected and any "actions that may cause loss, reduction of number or disturbance of natural habitat..." are prohibited. Companies and individuals who carry out economic activities in waters inhabited by Red Data Book species are responsible for their conservation. Western gray whales are classified as endangered under category I in the Red Data Book of the Russian Federation.

B) National legislation with respect to the bycatch of gray whales in fishing gears

There is no current national legislation on the bycatch of whales in the Russian Federation.

C) National legislation with respect to the prevention of and the reporting of ship collisions with gray whales

There is no current national legislation on the prevention of and the reporting of ship collisions with whales in the Russian Federation.

D) National legislation with respect to the reporting and response to gray whale strandings

Wildlife species found or living within the territory of the Russian Federation belong to the State. "Rare and endangered species, and also the species recorded in Red Book of the Russian Federation; species inhabiting the protected areas of federal significance; species inhabiting the territorial sea, the continental shelf and the exclusive economic zone of the Russian Federation; species that fall within international treaties concluded by the Russian Federation; particularly protected valuable marketable species; [as well as] naturally migrating species on the territory of two and more subjects of the Russian Federation" are federal property.

E) National legislation with respect to habitat degradation and marine protected areas

According to the Water Code of the Russian Federation, "operation of self-propelled and non-self propelled ships, and also of other facilities on the surface of bodies of water without devices for the collection of sewage waters, waste and dumpings developing on these ships and facilities shall be prohibited". When planning construction projects, such as the "...projecting and construction of ... pipelines ... , dams and other waterworks, the arrangements ensuring conservation of migration routes of ... [wildlife populations] and areas of permanent concentration thereof, including breeding and wintering areas, shall be envisaged and carried out". Furthermore "any activity entailing habitat alteration ... and deterioration of reproduction, feeding, rest conditions and migration routes ... [of wildlife species] shall be carried out in compliance with the requirements ensuring protection of the wildlife".

The Government of the Russian Federation is responsible for establishing regulations for the designation and use of water protection zones. These must be created in areas where the prevention of pollution and the preservation of wildlife habitat are required, with special attention to the "...life cycle (reproduction, growing, young stock, feeding, rest, migration, etc.)" of species. Within these zones, "certain activities ... shall be prohibited or regulated in relation to the period of execution ... and technology applied ... if disturbing life cycle..." of wildlife species.

According to the World Database on Protected Areas, the Russian Federation has a total of 86 marine protected areas under national jurisdiction and 16 under international jurisdiction (see Fig. 6).

F) National legislation with respect to the permits to carry out relevant scientific research

The "use of the wildlife for scientific ... goals by means of different forms of observation, marking, photographing and other research methods without removal of ... [wildlife] from natural habitat ... shall be authorized without special permit and free of charge if such methods do not damage the wildlife and natural habitat ... and do not infringe the rights of users of wildlife, other natural resources...". Agencies of the Russian Federation are responsible for permit issuance in regard to wildlife species classified as federal property.