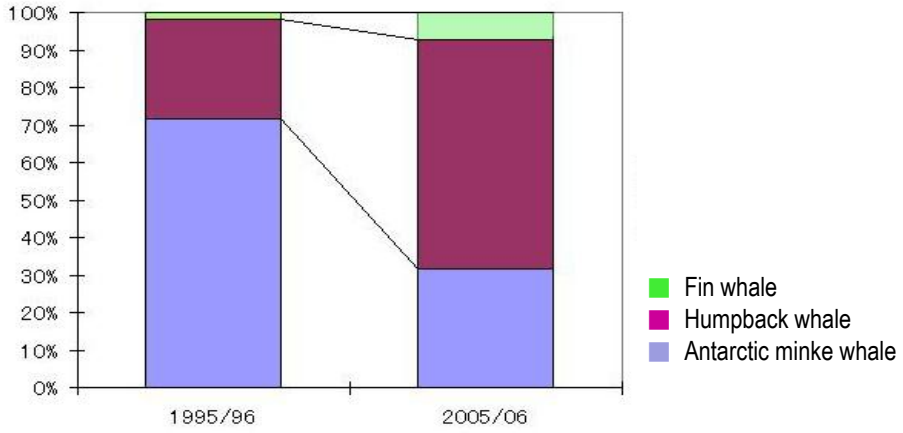
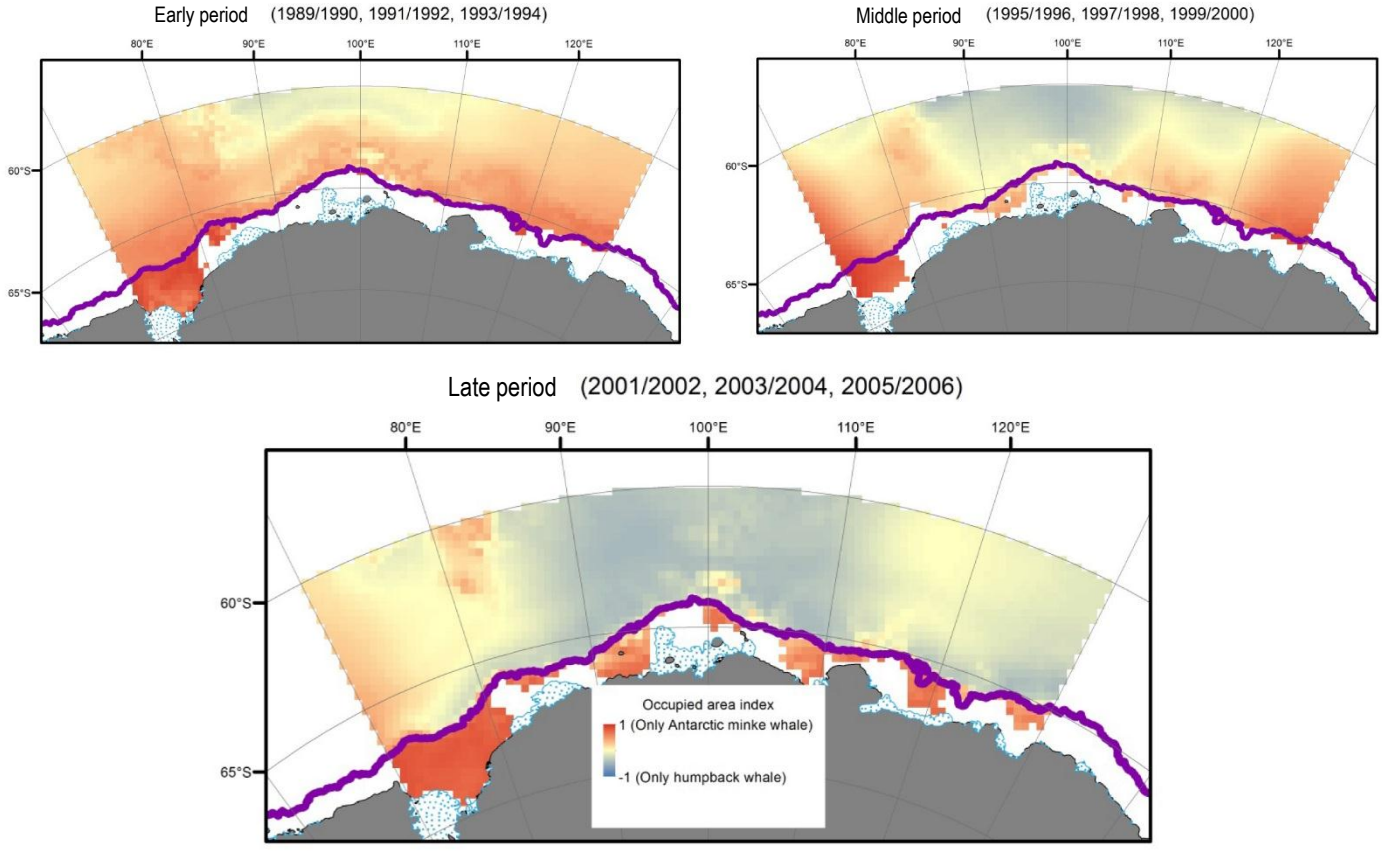
Findings from Japan's whale research in the Antarctic

2. Changes in Antarctic large whale species composition during the JARPA/JARPAII research period

The distribution range of humpback whales in research Area IV enlarged from 1989 to 2006, but the Antarctic minke whale distribution did not change over the same period and area. The number of humpback whale sightings was highest in Area IV while in Area V, humpback whales were second to Antarctic minke whales with regards to the number of sightings.





Occupied area indices of Antarctic minke and humpback whales in research Area IV in early (1989 to 1994), middle (1995 to 2000) and late (2001 to 2006) periods. If the index was 1 (red), only Antarctic minke whales were present in a unit area while only humpback whales were present if the index was -1 (blue). If the index was 0 (cream), probabilites of the presence of Antarctic and humpback whales in a unit area were identical.

(Murase,H., Matsuoka, K., Hakamada, T and Kitakado, T. Preliminary analysis of changes in spatial distribution of Antarctic minke and humpback whales in Area IV during the period of JARPA and JARPAII from 1989 to 2006. SC/F14/J18)

Findings from Japan's whale research in the Antarctic

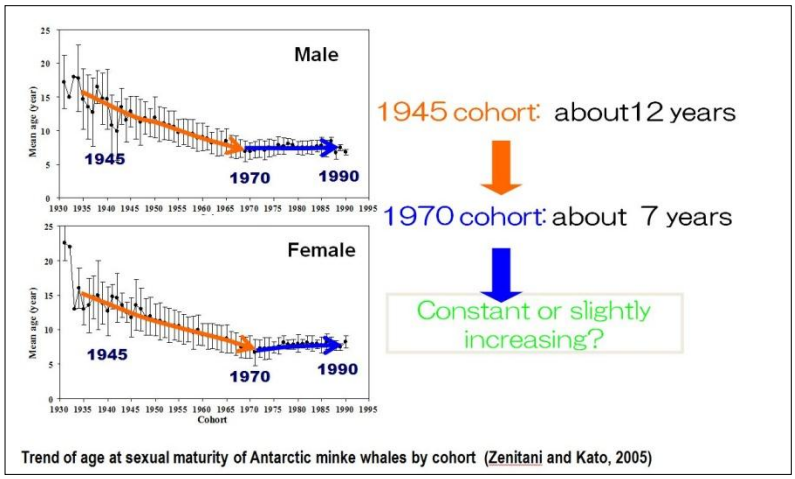
3. Antarctic minke whale changes

Stock abundance is almost constant

The Antarctic minke whale abundance showed no major change and has been almost constant throughout the whole JARPA II research area (IIIE to VIW areas) during the research period.

Change in sexual maturity

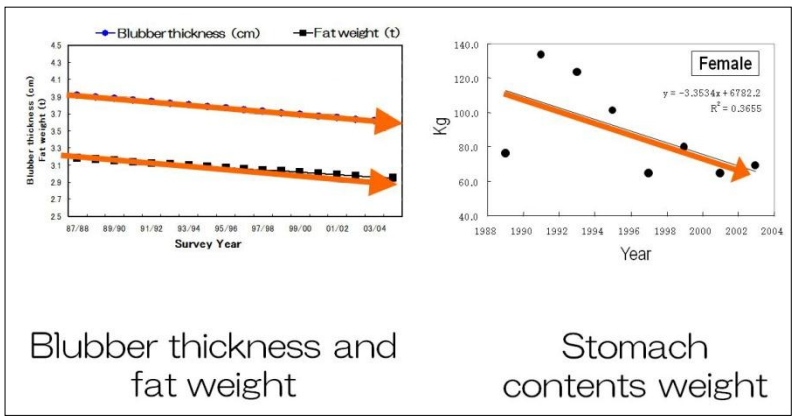
The Antarctic minke whale age at sexual maturity was about 12 years around 1945 but declined to 7 years by 1970 and has been constant or very slightly increasing since then. It is thought that this age at sexual maturity decline may be due to an increased growth speed. One of the causes of an increase in the Antarctic minke whale growth speed may be the rise in food (krill) availability resulting from the reduction of great baleen whale stocks by commercial whaling. However, in recent years, the abundance of some of these great whale species has increased too, so the food environment most favorable to the Antarctic minke whale may have already elapsed and may be now gradually deteriorating.



Trend of age at sexual maturity of Antarctic minke whales by cohort (Zenitani and Kato, 2005)

Whale nutrition index downturn

The thickness of the Antarctic minke whale blubber (a layer of fat under the skin where energy is stored) has been decreasing. The mean stomach content weight of whales in the offshore sea areas has been decreasing too. Further, the individual daily food intake has dropped as well, regardless of the whale's sex (male or female) and maturity/immaturity state. However, in sea areas where humpback whales are not distributed, such as the Ross Sea, the stomach content weight of (female) Antarctic minke whales has not decreased.

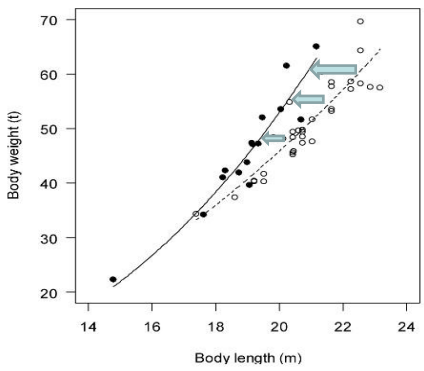


4. Fin whale changes

The data suggests that since commercial whaling times, the fin whale age at sexual maturity has been decreasing. Also, the body weight of fin whales taken during research whaling has increased compared to relative body lengths from the 1950s reports. These changes may be an indication of improved nutrition condition. Further, in the research area east side (V and VIW areas), a remarkable increase in fin whale population abundance was confirmed.

5. Environmental fluctuation

A decrease in sea ice due to the effect of global warming has not been detected in the research sea area. Pollutant and marine debris analysis show that the Antarctic Ocean environment supports one of the cleanest ecosystems of the world.



Fin whale body length and body weight relationship. Black dots and solid line show research whaling data while white dots and dotted line represent data from commercial whaling.

(Mogoe, T., Bando, T., Maeda, H., Kato, H and Ohsumi, S.. Biological observations of fin whales sampled by JARPAII in the Antarctic. SC/F14/J10)

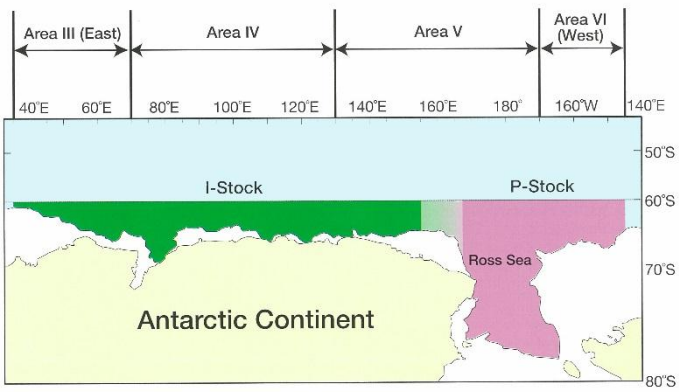
Findings from Japan's whale research in the Antarctic

Contribution to new management of whale resources

1. Antarctic minke whale stock structure

From DNA sequence and other data analysis, we now know that (1) there are two separate Antarctic minke whale stocks (I-stock and P-stock) distributing east and west in the research area; (2) the sea area where both stocks distribution overlaps broadens from the Area IV east side to the Area V west side and the boundary location changes from year to year; and (3) the stock distribution boundary may change depending on sex (male or female).
Besides the Antarctic minke whale, other findings include: humpback whale resources are increasing, segregation by whale species and their growth stages, and their extremely broad range of movement.

Antarctic minke whale stock structure hypothesis



2. Fin, humpback and southern right whale stock structure

Through genetic analysis, we have made advances in understanding the stock structure of three other baleen whale species, besides the Antarctic minke whale. For example, the distribution range of the humpback D-stock (western Australia) and E-stock (eastern Australia, New Caledonia, Tonga) has been analyzed in detail so that now it has become clear there are sea areas where only a single stock is distributing while in another area, the range of both stocks overlaps.

3. Suitability of IWC management areas

From the results of genetic and non-genetic analysis, it has become clear that (1) the distribution of individual Antarctic minke whale stocks does not match with the current management areas set by the IWC, (2) for humpback and fin whales, separate stocks within the current management Areas III, IV, V and VI do match with the IWC management areas; and (3) that within the research area, the southern right whale movements are mainly concentrated within Area IV.

4. Whale resource dynamics model and biological parameters

For sustainable utilization of resources, stock reduction due to capture and other factors and their natural increment must be balanced in a way that the number of captures exerts only a minimal change on the resource without affecting abundance.
Factors that may affect resource abundance, include human capture, mortality within the natural life cycle (due to predators, disease, starvation, stranding) and the recruitment of new generations through reproduction. The study of all these factors is of utmost importance for the management of whale resources.
Biological parameters such as the natural mortality index, recruitment rate, and pregnancy rate are pieces of information extremely important and necessary to understand the population dynamics of whales.

Conclusions up to now

The Antarctic ecosystem is undergoing big changes

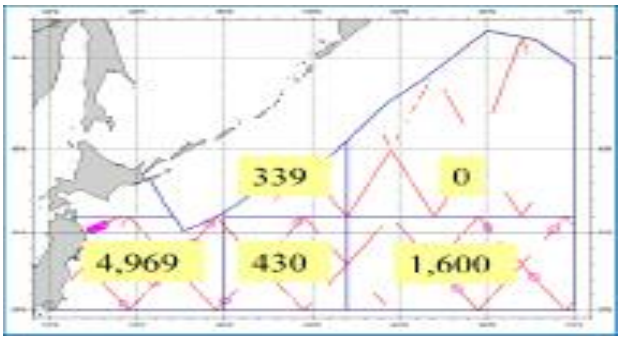
The findings introduced here are the result of Japan's long-term and comprehensive research effort. Japan's whale research combines both lethal and non-lethal components that allow us to obtain data from a wide range of research fields. The combined and comprehensive analysis of this data makes it possible to better understand the Antarctic marine ecosystem. As we know now that the Antarctic ecosystem is undergoing big changes, its monitoring through systematic and continuous research becomes all the more necessary in order to achieve the conservation and management of marine living resources.

Findings from Japan's whale research in the Western north Pacific

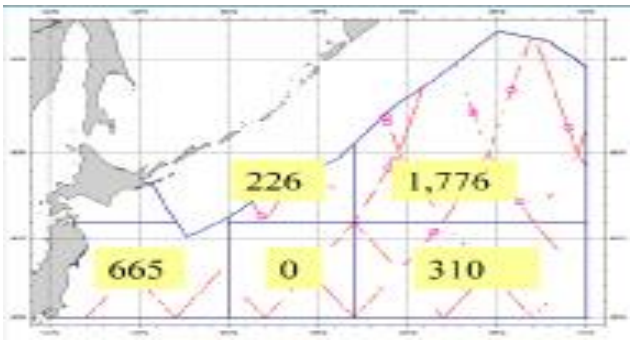
Number of whales distributing

A large number of minke whales is present during the months of May to June. In the following months (July to August), they migrate northward moving to the Okhotsk Sea. The numbers in yellow in the respective sea areas below indicate the number of whales distributing at a certain time and in a specific sea area. They do not indicate stock abundance.
Similar estimations have been calculated for Bryde's and fin whales. The data concerning the number of whales distributing is used to estimate the amount of fish resources consumed by whales in the JARPNII research area.

Minke whales in offshore waters



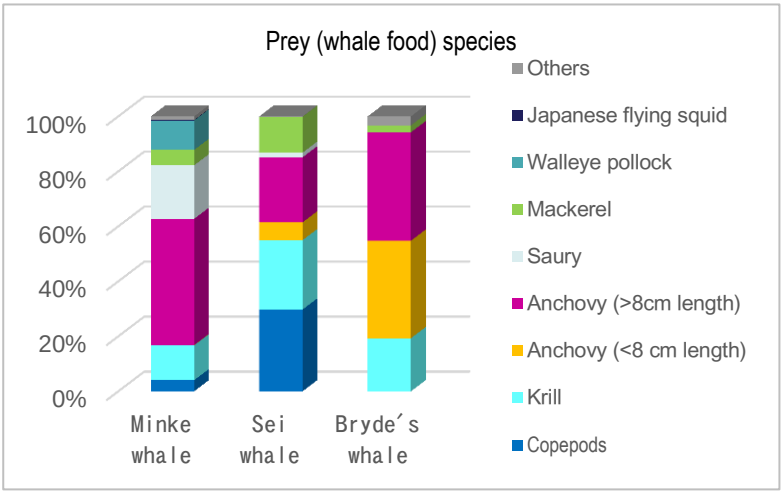
May to June: 7,338 whales distributing



July to August: 2,976 whales distributing

Assessment of feeding by whales

Whales feed on a wide range of fishery resource organisms ,including copepods, krill, anchovy, Pacific saury, mackerel, walleye pollock and Japanese flying squid. From JARPAII data ,it was estimated that from May to September ,minke whales consume 150,000 tons, sei whales 900,000 tons, and Bryde's whales consume 530,000 tons of food organisms.
Even within the same whale species, depending on the sea area and season, the type of food organism they consume changes. Further, we know now that prey type may change depending on the year. The kind of food organism they feed on also varies depending on whale species.



(Tamura, T., Konishi, K., Isoda, T., Okamoto, R and Bando, T. Prey consumption and feeding habits of common minke, sei and Bryde's whales in the western North Pacific . SC/J09/JR16)

Minke whale stomach containing Pacific pomfret and salmon

Minke whale stomach containing squids

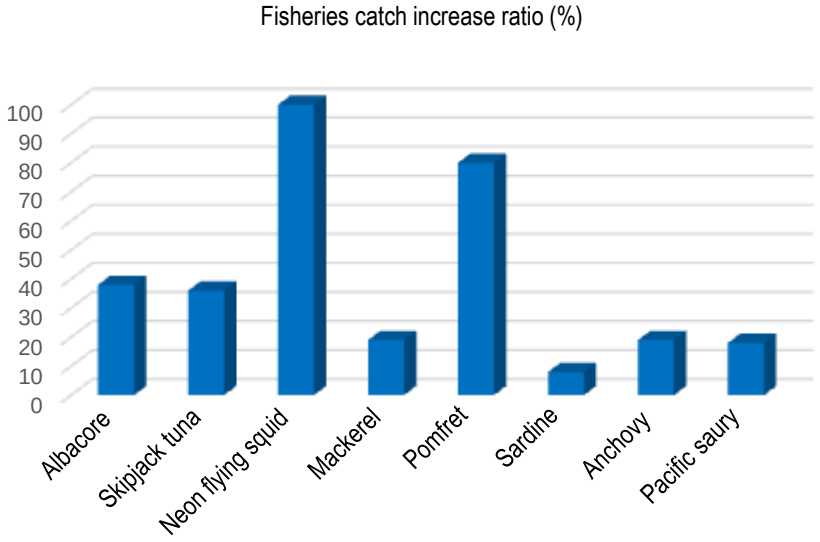
Sei whale stomach contents (Pacific saury)

Bryde's whale stomach containing anchovies

Findings from Japan's whale research in the Western north Pacific

Fisheries output change and whaling

As an example of data application in ecosystem modelling, let's assume that 4% of minke, sei and Bryde's whales' stocks were taken during a 50 year period. As the right figure shows, the results indicate that fisheries catches for species, such as anchovy, mackerel and skipjack tuna, would increase.

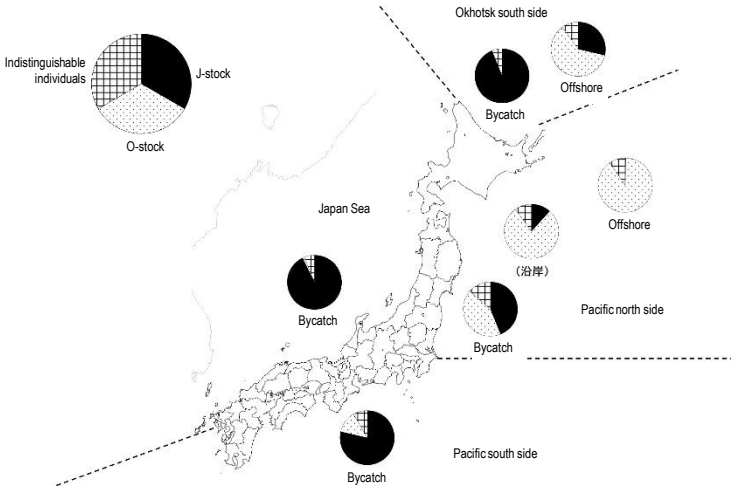


Stock structure elucidation

Genetic analysis of samples taken in the research program showed that minke whales in sub-areas 7, 8 and 9 belong to the same genetic group which is entirely different from the stock distributed in the Japan Sea. The results indicate that there are two different stocks of minke whales, one in the Pacific side (O stock) and another in the Japan Sea (J stock).

Further to the minke whale samples collected during the research program, the analysis of genetic data collected from minke whale coastal bycatch events across Japan, has now clarified that both J and O stocks actually mix in the Pacific coastal area, and it is helping us better understand their distribution situation along the Japanese coast.

* By-catch or incidental capture is when a marine mammal or other organism is unintentionally caught while fishing for a specific target species. The DNA registry of whales captured incidentally in fixed nets along the coast of Japan is obligatory. Tissue samples of such whales are compulsorily sent to the Institute of Cetacean Research for their DNA analysis and registration.



Distribution pattern of individual whales identified as belonging to either O-stock or to J-stock (circle shades indicate ratio)

Note: The white-checked shadow indicates indistinguishable individuals, i.e. individuals that could not be identified as belonging to either O-stock or to J-stock because their analysis did not include a complete identification marker.

Conclusions up to now

Future contributions to ecosystem model-based management of marine living resources including whales

- Whales prey on a number of other fisheries species consuming amounts large enough to majorly impact those resources. Whale abundance (number of individuals) and their amount of prey consumption are utilized as ecosystem model data. Calculations using these ecosystem models have already produced preliminary results. Obtaining such information which is useful to understand the ecosystem structure will make it possible for further improvement of the ecosystem models thus facilitating the availability of new information necessary for ecosystem-based management of fishery resources that are also whale prey species.
- The research program continues to monitor contaminants through pollutant studies on western north Pacific whales, prey species and environmental samples. These studies will contribute to future projections on pollutants in this sea area.
- The existence of two distinct minke whale genetic groups, the J-stock and the O-stock, is one piece of important information obtained through this research program.

Number of whales captured in whale research

Japan's whale research includes the capture of a number of whales in order to collect valuable scientific data. This number of whales is the minimum required for obtaining useful data and has no negative effect on the abundance of the whale species being studied.

Japan's whale research annual sample number is 100 sei whales, 50 Bryde's whales, 220 minke whales and 10 sperm whales in the western north Pacific and 850 Antarctic minke whales and 50 sperm whales in the Antarctic Ocean. These sample numbers have been calculated through statistical methods as the minimum required to obtain scientific data that may allow elucidation of different research objectives.

Further, the current abundance estimates for the whale research target species are as follows: Sei whale 21,612; Bryde's whale 20,501; minke whale 25,000; sperm whale 102,112; Antarctic minke whale 515,000; fin whale 11,755 (see table below).

In other words, Japan's whale research captures represent only 0.01% to 0.52% of the respective resource. Aiming for the sustainable utilization of whale resources, Japan's whale research capture levels are kept at the necessary minimum. As the data below clearly shows, the number of whales sampled has no negative effect on each resource species.

Species	Distributing area	Abundance	Sample number	Ratio
Sei whale	Western north Pacific	21,612	100	0.46%
Bryde's whale	Western north Pacific	20,501	50	0.24%
Minke whale	Western north Pacific	25,000	220	0.88%
Sperm whale	Western north Pacific	102,112	10	0.01%
Antarctic minke whale	Southern Hemisphere	515,000	850	0.17%
Fin whale	Southern Hemisphere	11,755	50	0.43%

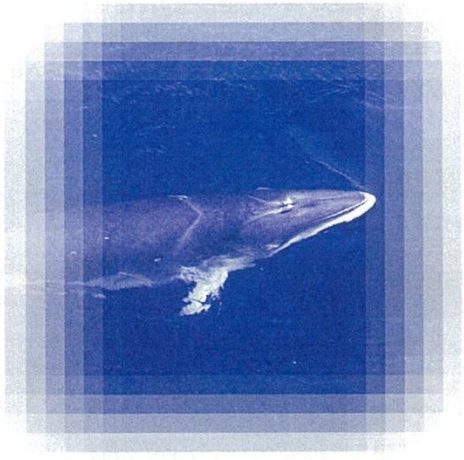
For more detail about sample size calculation see:
SC/57/O1 Plan for the Second Phase of the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA II) http://www.icrwhale.org/ResearchPlan.html

The Revised Management Procedure (RMP) and the Revised Management Scheme (RMS)

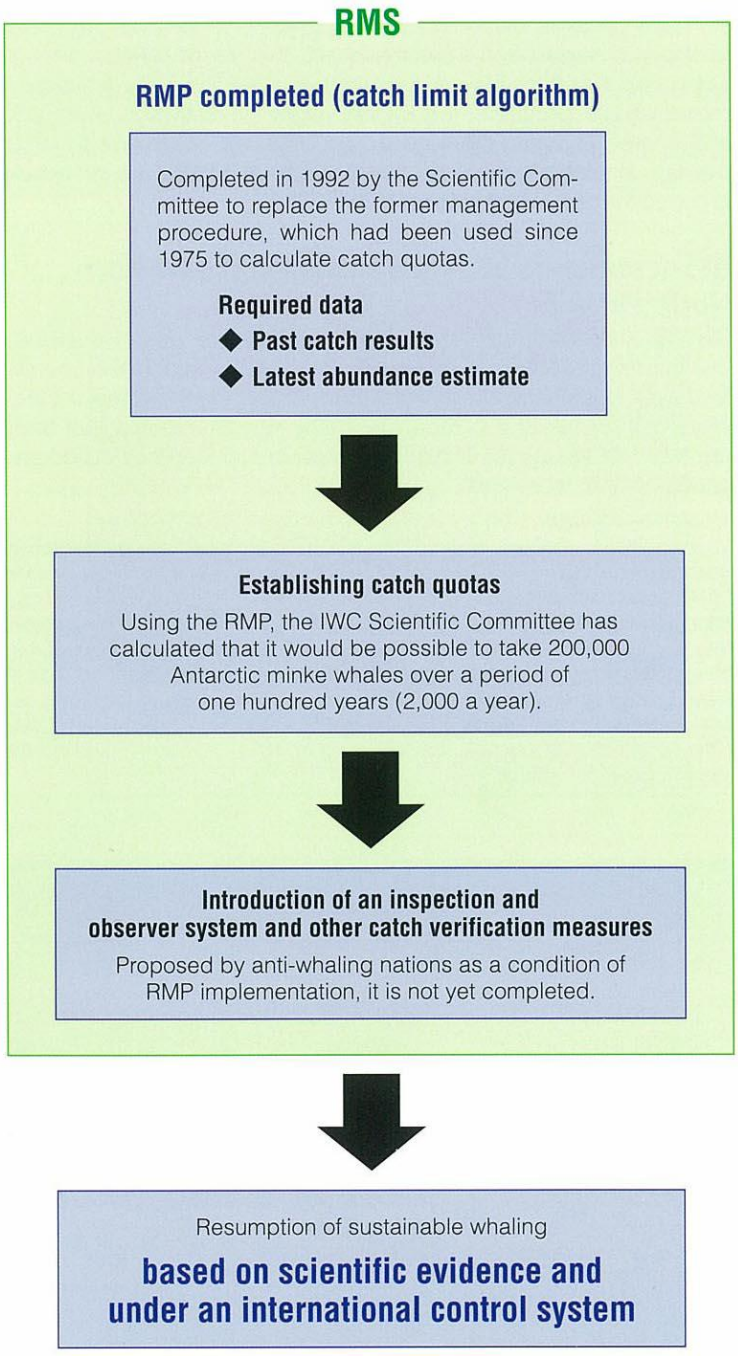
The moratorium on commercial whaling was introduced on the grounds that there were uncertainties in scientific knowledge concerning whale stocks and their management. In an effort to solve the problem, the IWC Scientific Committee completed the Revised Management Procedure (RMP) in 1992 after long and arduous discussions. The RMP is designed to calculate safe catch quotas taking uncertainty related to various factors into account and preventing any risk of depleting whale stocks. When the RMP was applied to Antarctic minke whales with an estimated population of 760,000, the result was that the capture of at least 2,000 Antarctic minke whales per year for the next hundred years would not have an adverse effect on the stock.

However, the anti-whaling countries proposed the introduction of an inspection and observer system and other catch verification measures as an additional condition for RMP implementation so that the RMS has not been completed yet.

After that, IWC discussions on the RMS continued for some time, but with the anti-whaling countries holding the majority and their refusal to review the moratorium on commercial whaling, the ongoing work for RMS completion was suspended as a matter of fact.
RMP: Revised Management Procedure
RMS: Revised Management Scheme



Completion of the RMS for the resumption of whaling



The ‘Future of IWC’ process

Antagonism between pro-sustainable use and anti-whaling countries at the IWC arising from disparities on their basic position about the utilization of whale stocks has led to the current situation where the IWC has become dysfunctional and unable to make any substantial decision on the management and conservation of whale resources. To resolve the situation, in 2008, the "Future of the IWC" process was initiated aiming to achieve a comprehensive agreement on the main issues faced by the Commission.

However, as no agreement was reached both at the 61st Annual Meeting held in Portugal in June 2009 and the 62nd Annual Meeting held in Morocco in June 2010, a one-year "consideration period" was established to last until the 63th Annual Meeting which was held in Jersey (Channel Islands) in July 2011. Despite these initiatives, as there was no progress made after the consideration period at the Jersey Annual Meeting, it was decided to continue encouraging dialogue amongst IWC member countries.

Under this no agreement situation, at the 64th Annual Meeting held in July 2012 in Panama, a decision was adopted that from now on, the IWC plenary would meet biennially (Commission Meeting in alternate years and Scientific Committee meeting annually). As for the "Future of IWC“, no progress has been made on specific tasks for the process, but the Commission stated its desire to encourage continuing dialogue and cooperation.

Japan will continue making efforts for the resumption of commercial whaling which was temporarily suspended by the 1982 IWC moratorium.

Commercial whaling today

Although the IWC objectives provide "to ensure proper and effective conservation and development of whale stocks" and "thus make possible the orderly development of the whaling industry", since the 1980s, many non-whaling countries suddenly joined the IWC while advocating the anti-whaling position under the leadership of anti-whaling groups, so that by 1982, the IWC moratorium (temporary suspension) on commercial whaling was adopted.

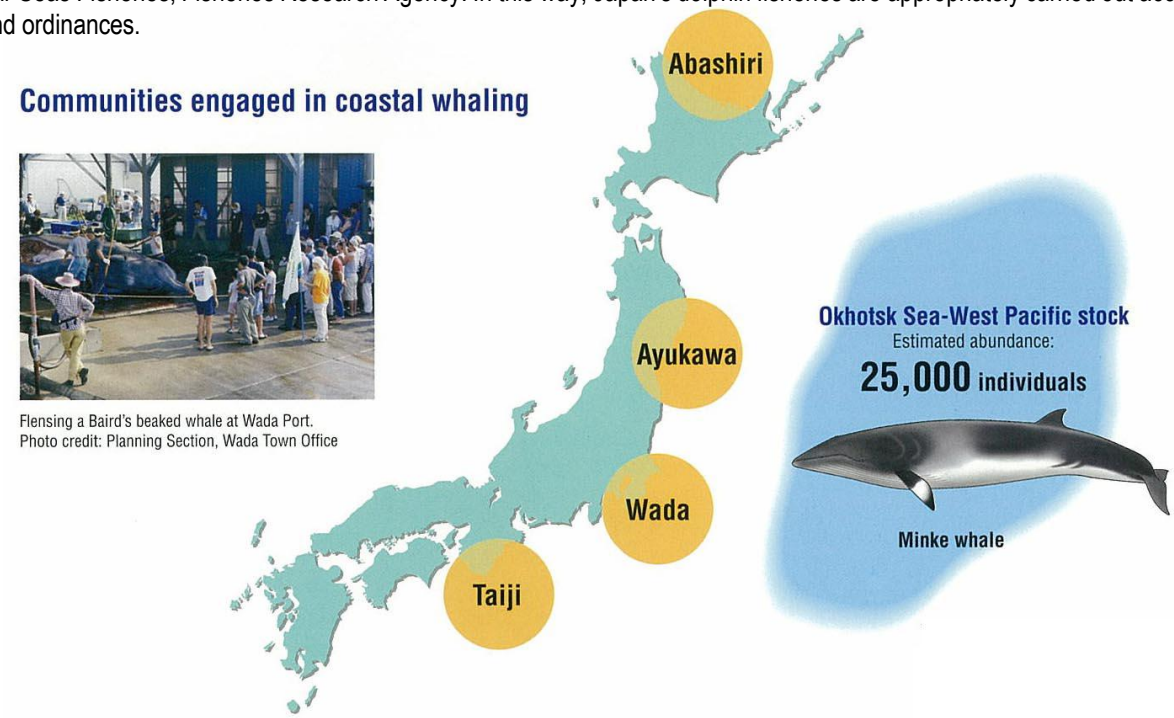
Facing this situation, Norway lodged an objection against the moratorium, and seeing the sub-paragraph provision requiring the revision of the moratorium ten years after its initial adoption not being observed, from 1993 formally restarted commercial whaling. In 1992, together with Iceland, Greenland and the Faeroe Islands, Norway signed the agreement establishing the North Atlantic Marine Mammal Commission (NAMMCO), an international body independent from the IWC for the conservation and management of resources.

Iceland withdrew from the Convention after the adoption of the Revised Management Procedure (RMP) was blocked by the anti-whaling forces in 1992 but rejoined in 2003 with reservations on the moratorium. From 2006, Iceland restarted its commercial whaling.

Whaling in Japan

Historical and archeological evidence show that the people along the coasts of Japan have been utilizing whales for more than nine thousand years. In the beginning, only stranded dolphins and whales may have been utilized. Afterward, around five thousand years ago, organized dolphin hunts were conducted near the Mawaki site in Ishikawa Prefecture on the Sea of Japan. Then, two thousand years ago, organized hunts of large whales were being conducted sporadically in western Japan. Today, whaling in Japan is present throughout the country in the various forms of many historical and cultural aspects inherited through generations. Whaling in Japan still has significant socio-economical and cultural importance in communities today and has a character similar in many ways to the aboriginal whaling carried out by the United States, Russia, Greenland and Caribbean peoples.
Present day whaling in Japan is classified as small-type coastal whaling and dolphin fisheries. Traditionally, the small-type coastal whaling mainly targeted the plentiful minke whale. However, the IWC implemented a temporary suspension of whaling even for abundant species since 1988. For that reason, the small-type coastal whaling communities cannot commercially utilize this abundant resource. They now engage, under the management of the Japanese government in the capture of Braid's beaked whales, short-finned pilot whales and false killer whales, which do not fall under the jurisdiction of the IWC. It is the long-cherished wish of these small-type whaling communities to resume commercial minke whaling.

Dolphin fisheries include spear fishing and drive fishing. There are dolphin fisheries in Hokkaido and in Iwate, Wakayama and Okinawa prefectures. The small cetaceans do not fall under the jurisdiction of the IWC and are managed under the responsibility of the coastal country government. In Japan, dolphin resources are managed similarly to other fisheries resources, and the Government of Japan sets catch quotas from the standpoint of sustainable utilization implemented through a permit system by the pertinent regional governments.
The dolphin fisheries catch quotas are set based on individual species' abundance estimations by the National Research Institute of Far Seas Fisheries, Fisheries Research Agency. In this way, Japan's dolphin fisheries are appropriately carried out according to law and ordinances.



Flensing a Baird's beaked whale at Wada Port.
Photo credit: Planning Section, Wada Town Office

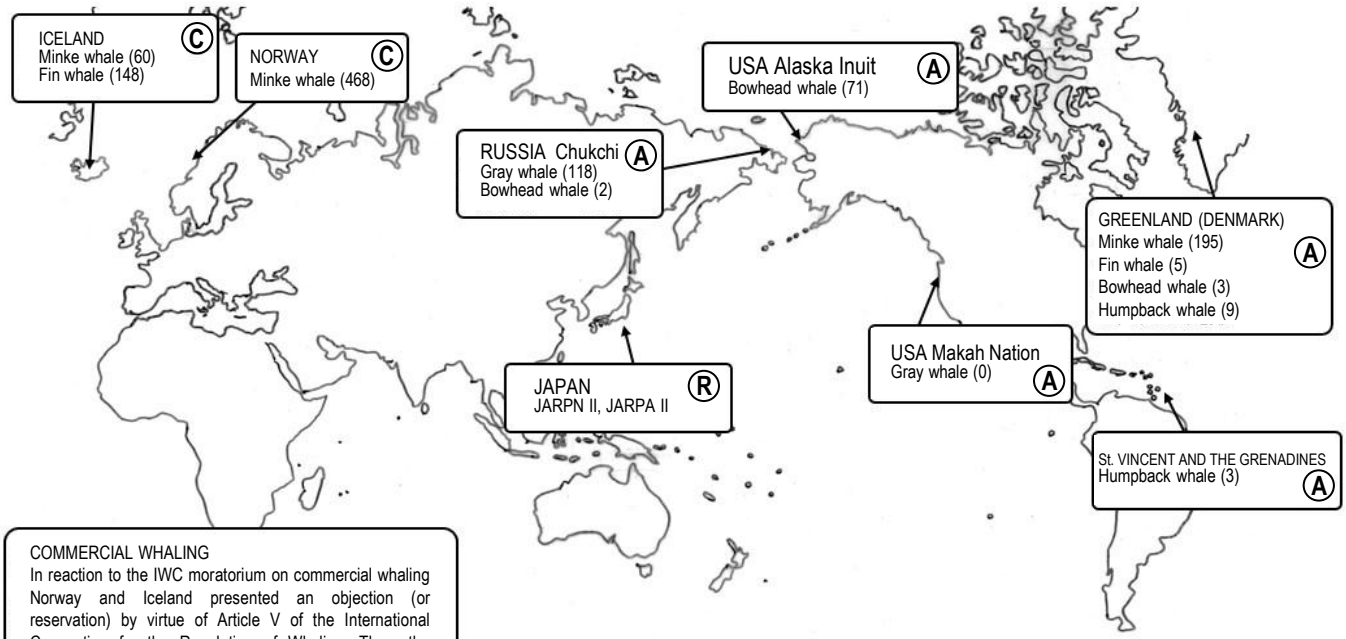
Government of Japan's position on the dolphin fisheries

Whales and dolphins are important fisheries resources ,and they should be utilized sustainably based on scientific evidence. Dolphin fisheries are one of Japan's traditional fishing activities, and they are conducted appropriately in accordance with the law.

Japan Small-Type Whaling Association website: http://homepage2.nifty.com/jstwa/

Whaling in the world

Whaling of IWC-managed species in the world
(A: Aboriginal subsistence whaling, C: Commercial whaling and R: Research whaling)



COMMERCIAL WHALING
In reaction to the IWC moratorium on commercial whaling Norway and Iceland presented an objection (or reservation) by virtue of Article V of the International Convention for the Regulation of Whaling. Thus, the moratorium decision does not apply to these countries and they are able to conduct commercial whaling.

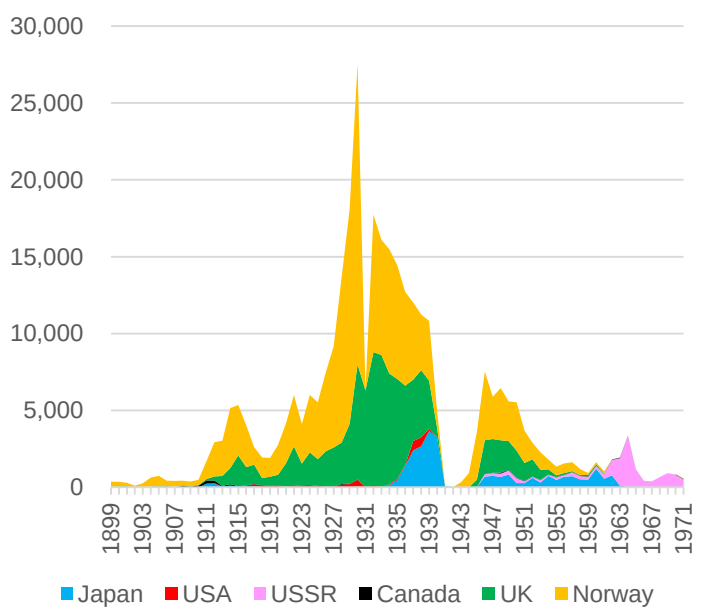
ABORIGINAL SUBSISTENCE WHALING
The IWC recognizes whale quotas set as necessary for the survival of indigenous peoples.

JAPAN'S SMALL-TYPE COASTAL WHALING
Community-rooted coastal whaling has characteristics similar to the aboriginal subsistence whaling. Japan has repeatedly asked the IWC to establish a catch quota for its small-type coastal whaling, but up to now, this request has been consistantly denied.

WHALING BY IWC NON-MEMBER COUNTRIES
CANADA (bowhead whale) and
INDONESIA (sperm whale)

* Figures in parentheses indicate number of whales captured in 2010 (Source: IWC)

Blue whale captures per country



Humpback whale captures per country