A SURVEY OF THE COMMERCIAL TRADE IN WHALE MEAT PRODUCTS IN JAPAN

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Executive Summary

This report by TRAFFIC East Asia examines the current status of commercial trade in whale products within Japan. In particular, analysis of trends in consumption (both volumes and prices) and of long-time stocks of whale products is carried out in some detail. Japan's domestic regulatory framework is also discussed, and recommendations to the Government of Japan conclude the report.

There are currently five legal sources of supply for whale products (including whales, dolphins and porpoises) in Japan: scientific (research) whaling, small-type coastal whaling, drive and hand harpoon fisheries, incidental take and strandings, and long-time stocks.

Japanese scientific whaling has been supplying around 1 000- 2 000 tonnes of whale products from captured minke whales *Balaenoptera acutorostrata* and *Balaenoptera bonaerensis* annually as a "by-product" which, in fact, subsidizes in part the scientific whaling operation. This is currently the main source where new whale products from species covered by the IWC moratorium could be added to the commercial market in Japan (another possible source is those whales taken incidentally, such as entangled in trap nets, or stranded).

Small-type coastal whaling supplies over 300 tonnes of whale meat from Baird's Beaked Whales *Berardius bairdii*, Risso's Dolphins *Grampus griseus* and Short-finned Pilot Whales *Globicephala macrorhynchus* each year. Drive fisheries (mainly in Wakayama Prefecture) and hand harpoon fisheries (mainly in Iwate Prefecture) together supply around 700~1000 tonnes of product each year from species including Dall's Porpoises *Phocoenoides dalli*, Striped Dolphins *Stenella coeruleoalba*, Spotted Dolphins *Stenella attenuata*, Bottlenose Dolphins *Tursiops truncatus*, Risso's Dolphins, Short-finned Pilot Whales and False Killer Whales *Pseudorca crassidens*.

Notifications issued by the JFA recommend that baleen and toothed whales entangled and drowned in trap nets be buried or burned; in principle, JFA allows whale parts and derivatives to be consumed within local communities only in areas of traditional consumption. However, notifications are not legally binding, so that currently it is not illegal to distribute whale products outside of local communities. TRAFFIC surveys (1999) have shown that at least some whale products from this source flow out of the local communities to supply the demand in urban areas such as Tokyo or Osaka.

Legal long-time stocks of species covered under the IWC moratorium date back at least to 1991, when imports from Iceland were halted following Iceland's withdrawal from the IWC. Long-time stocks also could be from domestic sources acquired prior to Japan's enforcement of the IWC moratorium in 1988. The government reported that legally obtained meat from five species of whales protected by the IWC was in storage in Japan (Anon., 1994).

Overall, Japan's frozen stocks of whale products have steadily decreased over the years. At the end of March each year, Japan had 22 157 tonnes of frozen stocks of whale products in 1980, 10 786 tonnes in 1987, 2 042 tonnes in 1992 and 1 121 tonnes in 1997, according to the statistics referred to earlier (Anon., 1976~1997). Judging from annual supply figures and trends in stocks, whale products consumption (including species not covered under the IWC moratorium) appears to have been in the range of 3000~4000 tonnes annually for the four-year period 1995-1998.

The report examines the technical and economic feasibility of long-term storage of whale meat

products. It appears that, despite some technical difficulties, whale meat could be stored for more than ten years without damaging its taste or flavor too much. However, deciding objectively how long whale meat could be stored would be an exceptionally difficult task. Research would be time-consuming and no standard universal measures of freshness, taste, or flavor exist.

The economic feasibility of long-term storage was examined using a standard economic framework and was found to be possible. While it is possible that long-term storage of whale meat is economically a rational behavior, it is also worth noting that the two wholesalers with Fin Whale stocks said that they were holding old stocks for cultural reasons, rather than for profit concerns.

Import of most whale products is specifically regulated under Japan's Decree of Import Trade Control. Import must first be approved by the Ministry of International Trade and Industry (MITI) before standard CITES import procedures begin. Any importation that threatens the conservation efforts carried out by the IWC will be denied (Anon., 1991a). Under current Japanese policy, the government will allow imports only from trade between IWC member countries.

No specific regulations are in place to regulate whale products trade within Japan. However, in cases where smuggling is proven to have taken place, the Customs Law and the Foreign Exchange Control Law of Japan can be enforced to prosecute smugglers. These laws apply even when the products have already crossed national boundaries and have been traded or stored within the country for some time.

In terms of monitoring and regulation of the domestic market, it is technically possible to identify the species by employing DNA analysis techniques, as was done by TRAFFIC in 1997 (Phipps *et al*, 1998) and by other organizations and agencies (JFA, 1997; Baker *et al*, 1996, 1996b, 1999). However, previous TRAFFIC reports have highlighted some of the potential problems in effective monitoring of the commercial trade in whale products using DNA analysis in a complex multi-species market such as Japan's (Mills *et al*, 1997; Phipps *et al*, 1998). Work done by TRAFFIC in Japan has identified shortcomings in the current domestic management system's ability to distinguish between legal and illegal whale meat in the marketplace as inclusion of samples from frozen stocks and incidental catch in the register is not mandatory. In Japan, a DNA register could provide an effective tool for monitoring whale meat stocks only if samples from all legitimate sources of whale meat were to be included.

TRAFFIC proposes the establishment of a comprehensive DNA register within Japan for whale species covered under the IWC moratorium, encompassing not only "by-products" from scientific whaling, but also imported products, incidental catch and strandings, and frozen stocks. For domestic trade management purposes, DNA profiling for all the imported whale products is desirable. DNA profiles stored in a databank could then be utilized for the monitoring of domestic trade in whale products to determine if products are from a legal source.

Inclusion of frozen old stocks could be achieved by setting a time limit for either selling off existing products or submitting a tissue sample for DNA profiling. Incidental take and strandings should not be overlooked albeit the amount supplied from this source would likely be very small in quantity. Reporting of incidental catch and strandings of baleen whales and Sperm Whales as well as submission of tissue samples should be mandatory and supported through legal penalties for violations. This framework would be a powerful tool in achieving an effective monitoring of trade in whale products. From an overall management perspective, it

would be appropriate to support the DNA register by requiring sellers of whale products to label products to indicate the species and geographic origin. Such a label would complement DNA analysis techniques in confirming product status, and make monitoring of trade in whale products far easier to implement in practice.

TRAFFIC recommends that the Government of Japan undertake the following actions for whale species covered under the IWC moratorium:

- Institute a mandatory policy for imported whale meat requiring submission of a tissue sample for DNA profiling and inclusion in a DNA register.
- Incorporate long-time frozen stocks into the DNA register by setting a time limit for either selling off products or submitting a tissue sample for DNA profiling.
- Institute a policy requiring the mandatory reporting of incidental catch and strandings of baleen whales and Sperm Whales as well as submission of a tissue sample for DNA profiling and inclusion in the register.
- Support the mandatory system for tissue samples submission through legal penalties for violations.
- Institute a mandatory system requiring sellers of whale products to indicate species and geographic origin of products with a label.
- Assign responsibility for market sampling and maintenance of the DNA register to an independent third party.

A SURVEY OF THE COMMERCIAL TRADE IN WHALE MEAT PRODUCTS IN JAPAN

Akiko Ishihara & Junichi Yoshii, TRAFFIC East Asia-Japan

Background

The governments of Japan and Norway have proposed for consideration at the eleventh Conference of the Parties to CITES the transfer of certain stocks of minke whale *Balaenoptera acutorostrata* and *Balaenoptera bonaerensis* from Appendix I to Appendix II. In addition, the government of Japan also has proposed the downlisting of the Eastern North Pacific stock of Gray Whale *Eschrichtius robustus* from Appendix I to Appendix II. If one or more of the down-listing proposals are accepted by the eleventh Conference of the Parties to CITES, international trade in whale products could resume. However, as TRAFFIC has pointed out in earlier publications (Mills *et al*, 1997; Phipps *et al*, 1998), the current Japanese system of domestic trade management cannot adequately detect illegal trade in whale products. Moreover, there is a need to evaluate the potential impact, both in terms of type and scope, that a resumption of international trade could have on trade flows of whale products within Japan.

The current project

This report by TRAFFIC East Asia examines the current status of commercial trade in whale products within Japan. In particular, analysis of trends in consumption (both volumes and prices) and of long-time stocks of whale products is carried out in some detail. Japan's domestic regulatory framework is also discussed, and recommendations to the Government of Japan conclude the report.

Methodology

In order to examine the current status of commercial trade in whale products within Japan, TRAFFIC East Asia-Japan chose in 1999 to focus its research on four main areas. Firstly, by means of an analysis of official statistics and interviews with fisheries product retailers, consumption trends in whale products were examined. Secondly, trends in whale meat prices were analyzed through the application of economic theory for prices. Thirdly, the feasibility of long-term storage of whale meat was examined through consultation with experts in the field, and surveys were conducted to review the current status of long-time stocks. Fourthly, in follow-up to previous observations made by TRAFFIC (e.g. Mills *et al*, 1997), Japan's existing regulatory system was examined in further detail.

TRAFFIC investigators visited major fisheries product retailers in the Tokyo area (including Tokyo and Yokohama) and the Hanshin area (including Osaka, Kyoto and Kobe) in September 1999. The following data was collected for 76 whale products found in 69 shops: price, species, origin of the products, and any other available relevant information. In addition, TRAFFIC conducted surveys encompassing major brokers, wholesalers and retailers in the cities of Tokyo, Osaka and Kobe to find out whether long-time whale meat stocks still remained, and, if yes, how the meat was preserved.

TRAFFIC consulted several fisheries experts from different bodies and organizations in the preparation of this report. These included two academics at Tokyo University of Fisheries, one a food scientist, the other a fisheries economist.

Prices are denominated in Japanese yen in this report. The exchange rate used was USD1:

JY102 (December 1999, Anon., 1999a) except where otherwise noted.

Findings

Whale product consumption in Japan

Five sources of supply

There are currently five legal sources of supply for whale products (including whales, dolphins and porpoises) in Japan: scientific (research) whaling, small-type coastal whaling, drive and hand harpoon fisheries, incidental take and strandings, and long-time stocks. These are summarized in **Table 1**.

Table 1
Sources of whale products and estimated yearly consumption in Japan, 1990-1998 (tonnes)

Year	(1) Scientific (research) whaling	(2) Small-type coastal whaling	(3) Drive and hand harpoon fisheries	(4) Incidental Take	(5) Yearly change in stocks	(6) Estimated yearly consumption
1990	1384	325	1394	62	- 2023	5188
1991	1483	371	1040	16	- 1501	4411
1992	1259	369	761	25	- 1123	3537
1993	1536	372	854	43	- 696	3501
1994	1445	344	849	50	+ 55	2633
1995	1656	377	817	59	- 282	3191
1996	2102	377	970	84	+ 110	3423
1997	2189	366	986	84	- 108	3733
1998	1989	361	704	74	- 448	3576

Sources: (1): Anon., 1996a; Anon., 1996-1998; (2), (3),(4): Anon 1991-1999; (5): Anon., 1976-1998

Notes: Yearly supplies from "(2) Small-type coastal whaling," and "(3) Drive and hand harpoon fisheries" are calculated as: number of cetaceans caught multiplied by the estimated average weight of derived whale products for each species. Based on the literature consulted (Ohsumi *et al*, 1991; Anon., 1996c; Anthony, 1990), TRAFFIC has tentatively put the average bodyweight of each species as follows: Dall's Porpoise - 0.08 tonnes; Striped Dolphin - 0.08 tonnes; Spotted Dolphin - 0.08 tonnes; Bottlenose Dolphin - 0.3 tonnes; Risso's Dolphin - 0.4 tonnes; Short-finned Pilot Whale (northern form) - 2.1 tonnes; Short-finned Pilot Whale (southern form) - 0.95 tonnes; Baird's Beaked Whale - 5.5 tonnes; Killer Whale - 6.0 tonnes; False Killer Whale - 1.0 tonne, Rough-toothed Dolphin 0.1 tonnes; Pacific White-sided Dolphin - 0.08 tonnes. It is assumed 50% of that bodyweight is lost during the processing. "(4) Incidental take" only includes minke whales caught in trap nets, and was calculated assuming that 3.1 tonnes of derived product is acquired from each whale specimen (Anon., 1996~1998). This is likely to represent upper-range figures as minke whales entangled and drowned in trap nets are often smaller than those caught on the open sea by Japanese research ships in the western North Pacific. "(5) Yearly change in stock" compares the amount of frozen stock remaining at the end of March each year. Negative "(5) Yearly change" (marked with '-') means that stocks actually decreased at the end of March that year, compared to the previous year. The possibility of double-counting exists between "(5) Yearly change in stock" and other columns. For example, whales taken in research could be held as frozen stock for more than a year. However, this does not happen in most cases, according to the current TRAFFIC survey. "(6) Estimated yearly consumption" was derived by summing up (1) through (5).

Japanese scientific whaling has been supplying around 1 000- 2 000 tonnes of whale products from captured minke whales annually as a "by-product" which, in fact, subsidizes in part the scientific whaling operation. This is currently the main source where new whale products from species covered by the IWC moratorium could be added to the commercial market in Japan (another possible source is those whales taken incidentally, such as entangled in trap nets).

The International Convention for the Regulation of Whaling, ICRW, under the terms of Article 8, allows Contracting Governments to grant “any of its nationals a special permit authorizing that national to kill, take, and treat whales for purposes of scientific research.” Japan undertakes the Japanese Whale Research Program under Special Permit in the Antarctic (JARPA) and the Japanese Whale Research Program under Special Permit in the North Pacific (JARPN) under this set of rules. In this report, the commonly used term "scientific whaling" refers to this type of operation.

It should be noted that the IWC has passed a number of non-binding resolutions regarding scientific whaling and calling for an end to the issuance of permits for lethal research whaling operations. Examples include the *Resolutions on Whaling Under Special Permit* IWC/50/41 and IWC/51/49 passed at the fiftieth and fifty-first meetings of the IWC in 1998 and 1999 respectively.

Small-type coastal whaling supplies over 300 tonnes of whale meat from Baird’s Beaked Whales *Berardius bairdii*, Risso’s Dolphins *Grampus griseus* and Short-finned Pilot Whales *Globicephala macrorhynchus* each year. TRAFFIC has estimated yearly supplies from this source using statistics for small cetacean catches prepared by the Japan Fisheries Agency (JFA) for IWC meetings (Anon., 1991~1999). Currently, small-type coastal whaling bases are located at Ojika in Miyagi Prefecture, Taiji in Wakayama Prefecture, Abashiri in Hokkaido Prefecture and Wadaura in Chiba Prefecture. Quotas are set by the JFA, and 1999 quotas were set at: Baird’s beaked Whales - 62; Risso’s Dolphins - 20; and Short-finned Pilot Whales - 100.

Drive fisheries (mainly in Wakayama Prefecture) and hand harpoon fisheries (mainly in Iwate Prefecture) together supply around 700~1000 tonnes of product each year from species including Dall’s Porpoises *Phocoenoides dalli*, Striped Dolphins *Stenella coeruleoalba*, Spotted Dolphins *Stenella attenuata*, Bottlenose Dolphins *Tursiops truncatus*, Risso’s Dolphins, Short-finned Pilot Whales and False Killer Whales *Pseudorca crassidens*. Again, quotas are set by the JFA. Yearly supplies were estimated using statistics compiled by the JFA for IWC meetings (Anon., 1991~1999).

In the past, 'dolphin' products (i.e. from small cetaceans) comprised a substantially different market from other whale products, mostly supplying demand in traditional consuming areas such as parts of Iwate, Akita, Yamagata, Wakayama, and Shizuoka prefectures (Anon., 1988). The halt in commercial whaling (i.e., after the 1987 season) appears to have resulted in increased demand for 'dolphin' products as a substitute for 'whale' products. Kasuya suggested that market flows for the meat of small cetaceans changed in response to this change in demand (Kasuya, 1989).

Fishery records indicate that levels of take for small cetaceans increased between 1988 and 1992. The JFA began setting quotas for the harvest of small cetaceans in 1991, and current catch levels are almost the same as before the halt of commercial whaling in 1988 (Anon., 1991-1999). Past market research by TRAFFIC found products from small cetaceans being sold as 'whale' meat in major urban centers such as Tokyo, Osaka, and Fukuoka (Phipps *et al*, 1998).

As these products are sometimes presented or sold as 'whale' products, it is appropriate to include drive and hand harpoon fisheries as a potential source of supply for whale products in Japan.

Notifications issued by the JFA recommend that baleen and toothed whales entangled and drowned in trap nets be buried or burned; in principle, JFA allows whale parts and derivatives to be consumed within local communities only in areas of traditional consumption. However, notifications are not legally binding, so that currently it is not illegal to distribute whale products outside of local communities (see ***Domestic Trade*** section). In fact, 1999 surveys by TRAFFIC revealed that at least some whale products from this source flow out of the local communities to supply the demand in urban areas such as Tokyo or Osaka. Therefore, **Table 1** includes those incidental catches as a possible source of commercial supply.

Yearly decreases in stockpiles of whale products, including small cetaceans, are presumed to represent the amount of frozen whale stock newly released into the market for any given year. Official statistics cited as references cover up to 80% of the total storage capacity in 59 major cities within Japan (Anon., 1976~1997). That was equivalent to about half the storage capacity for the entire country as of 1 November 1993 (Anon., 1996b). A 1999 TRAFFIC survey found that long-time whale product stocks remain to this day (see **Surveys** section below).

Legal long-time stocks of species covered under the IWC moratorium date back at least to 1991, when imports from Iceland were halted following Iceland's withdrawal from the IWC. Japan imported a total of 121 065 tonnes of whale meat between 1980 and 1987, mainly from the former Soviet Union (56 745 tonnes), Iceland (26 281 tonnes), Spain (12 506 tonnes), the Republic of Korea (7 017 tonnes) and Peru (8 142 tonnes). It imported a total of 2 890 tonnes of whale meat from Iceland (2 780 tonnes), Norway (90 tonnes) and former Soviet Union (20 tonnes) between 1988 and 1991 (Anon., 1996). Japan ceased commercial whaling in March 1988 pursuant to the IWC's moratorium on commercial whaling. Initially, Japan registered n objection to the IWC's 1982 decision on the commercial moratorium, but later lifted its objection as of the 1988 whaling season (Anon, 1991a).

Long-time stocks also could be from domestic sources acquired prior to Japan's enforcement of the IWC moratorium in 1988. The government reported that legally obtained meat from five species of whales protected by the IWC was in storage in Japan (Anon., 1994). These stocks could include minke whale, Fin Whale *Balaenoptera physalus* (including fin/blue hybrids from Iceland), Sei whale *Balaenoptera borealis*, Bryde's whale *Balaenoptera edeni*, and Sperm Whale *Physeter macrocephalus*.

Overall, Japan's frozen stocks of whale products have decreased steadily over the years. At the end of March each year, Japan had 22 157 tonnes of frozen stocks of whale products in 1980, 10 786 tonnes in 1987, 2 042 tonnes in 1992 and 1 121 tonnes in 1997, according to the statistics referred to earlier (Anon., 1976~1997).

Judging from annual supply figures and trends in stocks, whale products consumption (including species not covered under the IWC moratorium) appears to have been in the range of 3000~4000 tonnes annually for the four-year period 1995-1998.

Whale products at the retailer level

TRAFFIC investigators visited major fisheries retailers in the Tokyo area (including Tokyo and Yokohama) and the Hanshin area (including Osaka, Kyoto and Kobe) in September 1999.

Seventy-six whale meat products were found in 69 retail shops: 41 products in the Tokyo area, 35 products in the Hanshin area. Price, species, origin of the meat, and any other available relevant information was collected at each site. **Table 2** summarizes the price results (the number of samples labeled or claimed as being minke whale is shown in brackets). For comparison, the price at which "by-products" from scientific whaling is sold to wholesalers is shown in **Table 3.**

Table 2
Retail prices for whale products in Japan (JPY/ 100 grams)

Price range		**Number of product (samples)**				
JPY/100g	**USD/100g**	**Sashimi**	**Onomi**	**Bacon**	**Sarashi**	**Koro**
0-999	0-9.79	17 (6)	2 (2)	5 (4)	14 (3)	
1000-1999	9.80- 19.6	12 (3)		5 (0)		1 (0)
2000-2999	19.61- 29.4	1 (0)		9 (0)		1 (0)
3000-3999	29.41- 9.21			4 (2)		
4000-4999	39.22- 9.01			3 (0)		1 (0)
5000-5999	49.02- 8.81			1 (0)		

Source: TRAFFIC East Asia-Japan
Note: Number of samples labeled or claimed as being Minke Whale shown in brackets.

Table 3
Official prices of whale "by-products" from scientific whaling in 1998 (JPY/ 100 grams)

Product	**Price (currency/100g)**									
	Akaniku		**Oniku**		**Unesu**		**Oba**		**Honkawa**	
	JPY	**USD**	**JPY**	**USD**	**JPY**	**USD**	**JPY**	**USD**	**JPY**	**USD**
Special grade	464	4.6	--	--	--	--	--	--	--	--
1st grade	327	3.2	890	8.7	586	5	594	5.8	286	2.8
2nd grade	14	3.1	494	4.8	208	2	115	1.1	90	0.9

Source: Anon., (1996~1998)

Commonly, *akaniku* (red meat) is cut and served as *sashimi* (raw meat) at the retail level. Sliced *oniku* (tail meat) is called *onomi* (tail meat) at the retail level, and *unesu* (accordion-like area of baleen whales from the lower jaw to the navel) is usually processed and served as bacon (Onishi, 1995). *Oba* (fluke or tail fin) is processed and sold as *sarashi*. *Honkawa* (skin) can processed to be sold as *koro* (fried skin with fat).

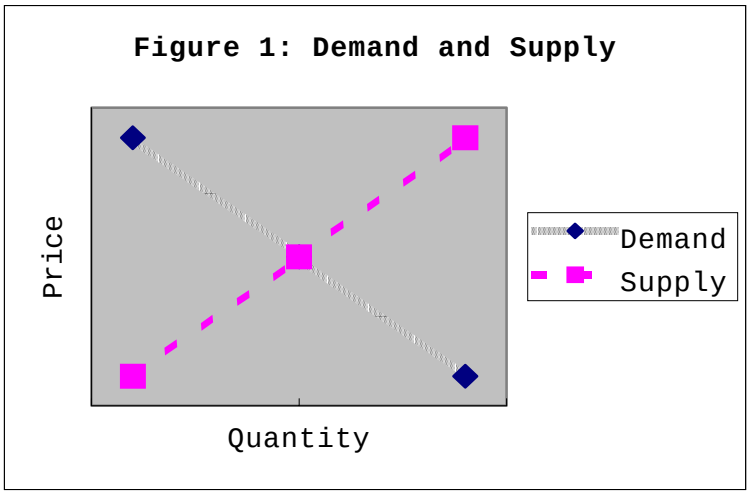
It is very difficult to tell what proportion of the whale products sold at the retailer level are from scientific whaling. Among the 76 samples, 20 were labeled or claimed as being minke whale products. Three samples were labeled or implied to be from domestic sources such as drive and hand harpoon fisheries, or small-type coastal whaling. Neither species nor origin of the product was specified for the remaining 53 samples.

What prices indicate: economic theory applied to Japan's whale meat market

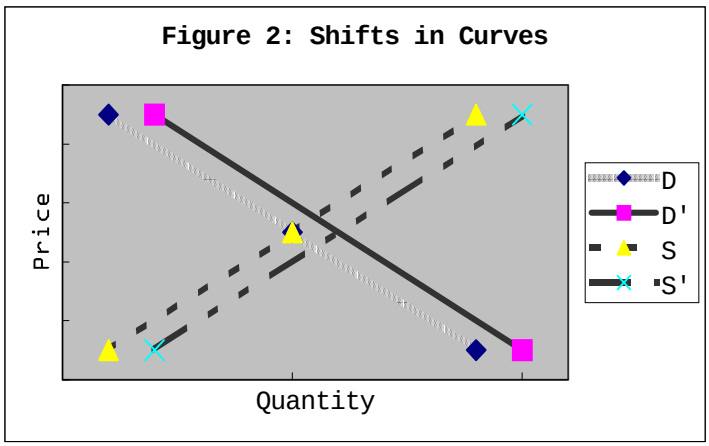
Economic theory reviewed

The following is a review of standard economic theory based on Nicholson (1995) regarding how prices are formed in the market. Market prices are in fact *equilibrium* prices: that is, they reflect both demand and supply conditions. The standard supply-demand framework is

presented in **Figure 1**. The supply curve is normally upward sloping since production costs rise as more output is produced. The demand curve is normally downward sloping since as quantity increases, people are willing to pay less and less for the last unit purchased. Changes in supply conditions shift the supply curves.



As an example, **Figure 2** shows a downward shift to S' where more output is produced for a given price. Changes in demand conditions shift the demand curves. **Figure 2** also shows an upward shift to D' where a higher price is paid at a given quantity. Equilibrium results at the intersection of a demand curve and a supply curve: that is, the equilibrium price reflects both demand and supply conditions at the time. Thus, changes in the market price indicate either a change in the demand condition, or a change in the supply condition, or both.



Existing sources of price information

Yearly average prices for whale meat at ten of the biggest (fisheries) wholesale markets in Japan (those in Sapporo, Sendai, Tokyo, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Hiroshima and Fukuoka) are available (Anon., 1976~1998). The average prices in the statistics are calculated as the total monetary value of whale meat transactions divided by the quantities traded. These markets are de facto price leaders since they encompass more than 50% of total wholesale transactions on fisheries products in Japan.

Trends in whale meat prices: what they indicate

Table 4 shows whale meat prices (normalized at 1996 levels using the Consumer Price Index prepared by the Japanese government's Economic Planning Agency) at the ten biggest (fishery) wholesale markets in Japan for the period of 1976~1997 (Anon., 1976~1998). Whale meat prices have risen significantly over the years as supply dwindled to around 3/100 of what it was in 1976.

Table 4
Average whale meat prices at the ten biggest wholesale markets in Japan (tonnes; Yen/kg)

Year	Volume (tonnes)	Price	
		(JPY/kg)	(USD/kg)
1976	32 654	544	5.3
1977	32 289	609	6
1978	34 910	692	6.8
1979	31 221	645	6.3
1980	18 629	844	8.3
1981	19 739	806	7.9
1982	18 737	948	9.3
1983	13 956	1112	10.9
1984	15 400	1046	10.3
1985	13 780	1091	10.7
1986	10 239	1259	12.3
1987	8 229	1542	15.1
1988	5 054	1530	15
1989	3 033	1849	18.1
1990	1 923	2172	21.3
1991	1 481	2754	27
1992	990	3288	32.2
1993	618	3543	34.7
1994	539	3972	38.9
1995	631	3162	31
1996	780	3467	34
1997	801	3691	36.2

Source: Anon., (1976-1998)

Is it possible to detect a relationship between the wholesale market price and the quantity traded? The following logarithmic function shows a significant fit (statistically, it has a value of 0.98 for adjusted R-squared) with the relationship between the price and the quantity traded:

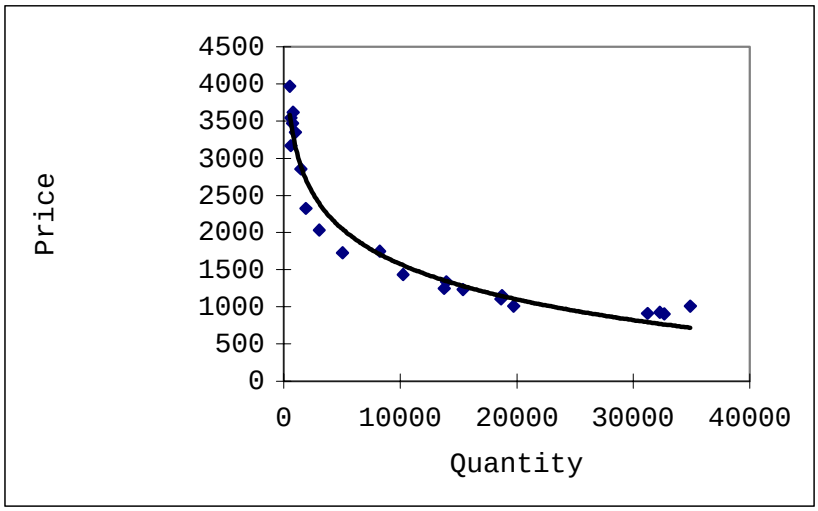
Log(PRICE)=10.4162 - 0.343357*Log(QUANTITY).

This function can be interpreted as the market demand function, in terms of the economic theory introduced earlier. As discussed above, the market prices used in deriving the above function are in fact *equilibrium* prices: that is, they are the result of both demand and supply conditions. The supply of fisheries products such as whale meat, unlike that of manufactured products, often is not elastic (i.e. responsive) to price changes. That means that supply curves are vertical rather than upward sloping, and shift horizontally as S' or S" in **Figure 3,** reflecting changes in the number of whales caught for that year. Thus, if demand conditions were fairly unchanged over the years, the above function shows the market demand function of whale meat at the

wholesale market level.

In short, the above function estimates equilibrium prices at the wholesale market level, for a given quantity supplied that year. For example, a 1% increase (decrease) in whale meat supply would result in a 0.34% fall (rise) in its transaction price at the wholesale market level.

Figure 3
Prices at wholesale markets



Old stocks and the feasibility of long-term storage

Overview

Japan ceased commercial whaling in March 1988, and Japan's last import from Iceland arrived in 1991. Since that time, scientific whaling has been the main source where new whale products from species covered by the IWC moratorium legally could be added to the commercial market in Japan (see ***Five Sources of Supply*** section above). Realistically, it is very difficult for anyone to evaluate the extent to which legal long-time stocks (i.e., whale products from species covered by the IWC moratorium dating back at least to 1991) still remain today. Whale products have been freely traded throughout Japan for years, so that legal long-time stocks could, in principle, belong to any broker, wholesaler, retailer or individual at this point in time.

The technical feasibility of long-term storage

It is difficult to determine exactly how long whale meat can be stored in a refrigerator without damaging its freshness, taste or flavor. A yardstick was provided by Japanese Association of Refrigeration in 1984, which said that six months at under –18° Celsius or else 12 months under –20°C would be the appropriate length of time for whale meat storage (Anon., 1984). However, this standard was established in light of the national need at the time to save on energy. Moreover, as long as supply flows continued, there would have been no compelling need at that time for storing the meat for more than one year.

Technically, *deep freezing* (i.e., freezing below –18°C) has the effect of restraining biochemical and bacterial changes. The lower the storage temperature, the longer the meat is likely to keep

its freshness over time (Anon., 1992). Facilities with ultra-low temperature storage capacity (i.e., freezing below -40°C) are not uncommon in Japan, although they are normally reserved for storing tuna.

Raw meat has to be frozen quickly so that countless ice particles form within the cells (Anon., 1992). Moreover, the storage temperature has to be kept strictly steady over time. Failure to do so would result in lower quality meat. Even meat stored under ideal conditions undergoes irreversible changes when stored for a very long time. For example, ice particles grow larger, ultimately damaging the tissues around them (Anon., 1992).

Another important factor is the impact of *freeze burn*, in which the exposed surface of the meat becomes damaged over time (Anon., 1992). This can be prevented by applying *vacuum-plastic packaging*, or *glazing* (i.e., covering the meat with a layer of ice). The alternative is to discard the damaged outer portions of the meat at the time of sale.

In spite of these technical difficulties, it appears that whale meat could be stored for more than ten years without damaging its taste or flavor too much. A food scientist at Tokyo University of Fisheries commented that long-term storage (ten years or more) technically would be possible when stored at -40°~-50°C in accordance with the standard procedures mentioned above (i.e., quick-freezing, stable temperature over time within the storage facilities, and glazing) (Professor R. Takai, Tokyo University of Fisheries, *in litt*. to A. Ishihara, November 1999). However, deciding objectively how long whale meat could be stored would be an exceptionally difficult task. Research would be time-consuming and no standard universal measures of freshness, taste, or flavor exist.

Surveys

TRAFFIC conducted surveys encompassing major brokers, wholesalers, and retailers in the cities of Tokyo, Osaka and Kobe. The ultimate goal of these surveys was to find out whether long-time stocks still remained, and, if they did, how the products were preserved. TRAFFIC prepared a questionnaire sheet and investigators contacted sellers, asking as many questions as possible following a given set of instructions. Interviews were conducted by telephone at the broker and wholesale levels and in person at the wholesale and retail levels. In some instances, it was not possible to obtain answers for some of the prepared questions. One wholesaler in Osaka refused to be interviewed.

Fifteen brokers registered at the central (fisheries) wholesale markets in Tokyo, Osaka and Kobe were contacted by telephone. They first were asked whether they dealt in whale products (10 answered yes), and if they did, whether they held stocks in long-term storage (all answered in the negative). At the same time, five major retailers in Tokyo selling whale products were visited. None of those retailers were found to hold stocks of their own over the long term. During this process, it became clear that it would be the wholesalers, rather than brokers or retailers, who would be most likely to privately hold whale meat stocks for long periods of time.

Wholesalers dealing in whale products have formed business associations in each of the three markets (i.e., central fisheries wholesale markets in Tokyo, Osaka and Kobe). Of the 14 wholesalers found to be currently dealing in whale products in these cities, 11 responded to inquiries by TRAFFIC. Among them, eight were interviewed by telephone and three were visited.

All 11 wholesalers said that they bought whale products from scientific whaling each year. Two

wholesalers responded that they currently hold long-time stocks (namely Fin Whale), and two others were found to deal in *koro* (i.e., fried skin with fat) made from Sperm Whale. The wholesalers acknowledged that the going price for *koro* from Sperm Whale is approximately Yen 15 000~Yen 17 000 per kg (USD147-167), and that the price for *onomi* (tail meat) from Fin Whale is approximately Yen 50 000~Yen 60 000 per kg (USD490-588).

TRAFFIC also researched how whale meat is normally stored. Among the eleven wholesalers who responded to inquiries by TRAFFIC, ten said that they entrusted the meat to local storage facilities, with the storage temperatures in the range of –20°C to –30°C. The remaining wholesaler responded that he preserved the meat in his own refrigeration unit at –40°C. One wholesaler with Fin Whale stocks mentioned above said that he kept the meat at around –20° degrees, while another wholesaler said he kept it at around –25° degrees. However, the former added that the outer 30% of the meat would be discarded at the time of sale, the latter said he would do the same for the outer 10%.

Two wholesalers responded positively when they were asked whether they apply *glazing* (explained in the technical section above) to the meat, and one answered no. Others were not aware of procedures used at the storage site and were unable to specify. As for *vacuum-plastic packaging*, two answered they did not employ the technique, and the rest were not aware of procedures used at the storage site and were unable to specify.

Economic feasibility of long-term storage

The issue of technical feasibility aside, there remains a fundamental question about the long-term storage of whale meat: does it pay to preserve the meat for that long?

TRAFFIC chose to examine as a specific case whether it is economically justifiable to preserve until today the tail meat from Fin Whale obtained by a wholesaler in 1979. It was not possible to obtain first-hand price information dating back to 1979, so the 1979 price of the meat is tentatively set to "x" (i.e. unknown variable). The cost of storing the meat was assumed to be constant over the years at the current rate of Yen 240 per kg (USD2.4) per year. Under the assumption that the outer 20% of the meat would be discarded at the time of sale, 1 kilogram of tail meat obtained in 1979 would now be worth Yen 40 000~Yen 48 000 (USD392-471) (see the ***Surveys*** section above).

Alternatively, what would happen if the cash invested in this meat were to be invested in another asset? The average rate of interest in the period 1979-98 is around 5.65% (Economic Statistics Monthly, Bank of Japan), so this investment would now be worth:

$$\text{Yen } x*(1+0.0565)^{20} + \text{Yen } 240*(1+0.0565)^{20} + \text{Yen } 240*(1+0.0565)^{19} + \text{Yen } 240*(1+0.0565)^{18} + 240*(1+0.0565)^{17} + \ldots\ldots\ldots + \text{Yen } 240*(1+0.0565)^{3} + \text{Yen } 240*(1+0.0565)^{2} + \text{Yen } 240*(1+0.0565) = \text{Yen } (3x + 8\,984).$$

Now, the decision by the wholesaler to buy and store the tail meat for 20 years can said to be justifiable economically if 40 000~48 000 > (3x + 8 984), or x < 10 339 ~ 13 005. That is, the wholesaler could do better than the market rate of return if the meat was acquired at a price below Yen 10 339~Yen 13 005 in 1979. If the ratio of Fin Whale meat prices to average prices at the ten biggest wholesale markets was unchanged over the years, Fin Whale meat should have been worth approximately Yen 9 611 per kg back in 1979 (USD40 at 1979 rates). This is below the threshold level of Yen 10 339~Yen 13 005 meaning that long-term storage of this kind is found to be justifiable economically.

Regulatory Framework

Domestic Trade

A notification issued by JFA in June 1990 recommends that baleen whales and Sperm Whales entangled and drowned in trap nets (fixed or stationary nets) be buried or burned; in principle, JFA policy allows whale parts and derivatives be consumed within the local community only in traditional consuming areas (JFA official, pers. comm. to A. Ishihara, TEA). A similar notification was issued on March 1991 for all remaining toothed whale species (JFA official, pers. comm. to A. Ishihara, TEA).

Notifications are commonly used administrative tools of government ministries and agencies in Japan. They are normally interpreted as administrative orders, and are followed by related parties and individuals accordingly. However, notifications are not legally binding, so that currently it is not illegal to distribute whale parts and derivatives outside of local communities even if such action constitutes a violation of the two notifications.

JFA issued a separate notice on October 1998 requesting cooperation in collecting tissue samples for DNA profiling, from minke and other whales taken incidentally and also from stranded animals (JFA official, pers. comm. to A. Ishihara, TEA). This again takes the form of administrative orders, without being legally binding. These notices are intended to form part of a system to better manage the commercial circulation of minke whale products.

DNA profiles have been made for whales caught during scientific whaling. Sellers of whale products from scientific whaling are advised by the distributor to indicate the products as such (e.g., with a label, see **Figure 4**).

No specific regulations are in place to regulate whale products trade within Japan. However, in cases where smuggling is proven to have taken place, the Customs Law and the Foreign Exchange Control Law of Japan can be enforced to prosecute smugglers. These laws apply even when the products have already crossed national boundaries and have been traded or stored within the country for some time.

International Trade

Import of most whale products is specifically regulated under Japan's Decree of Import Trade Control. Import must first be approved by Ministry of International Trade and Industry (MITI) before standard CITES import procedures begin. Any importation that threatens the conservation efforts carried out by the IWC will be denied (Anon., 1991a). However, CITES Appendix II-listed species such as Narwhals *Monodon monoceros* and White Whales (Beluga) *Delphinapterus leucas* are exempt from this rule, and only standard CITES import procedures for Appendix II-listed species apply. Import for these species will be automatically granted in cases where an export permit is issued by the state of export.

The details of the regulations are as follows (see **Figure 5** and **Figure 6**). For CITES Appendix I-listed species (excluding the six species which Japan has reservations on), commercial import is prohibited in accordance with CITES. For CITES Appendix II-listed species (excluding dolphins, true porpoises, Narwhal, Beluga and river dolphins) and those CITES Appendix I-listed species which Japan has reservations on, import must first be approved by MITI before standard CITES procedures begin.

The approval from MITI required for most whale imports is as follows. Importation from Brazil, Norway, Peru, Republic of Korea, Spain and Russia must be approved by both the JFA and MITI (*Import Annotations 60/256, 60/24, 4/21, 9/13*; *Import Notice 2*). Brazil, Norway, Peru, Republic of Korea, Spain, Russia were all once exporters of whale meat to Japan. For importation from IWC member countries other than Brazil, Norway, Peru, Republic of Korea, Spain or Russia, approval from MITI is required (*Import Annotations 55/58, 56/11, 60/26*). For non-IWC member countries, import will not be granted in accordance with practices agreed to by the IWC (*Import Annotations 54/10*).

Figure 4
Label for whale products from research whaling

Figure 5
Japan's import regulations by species of cetacean

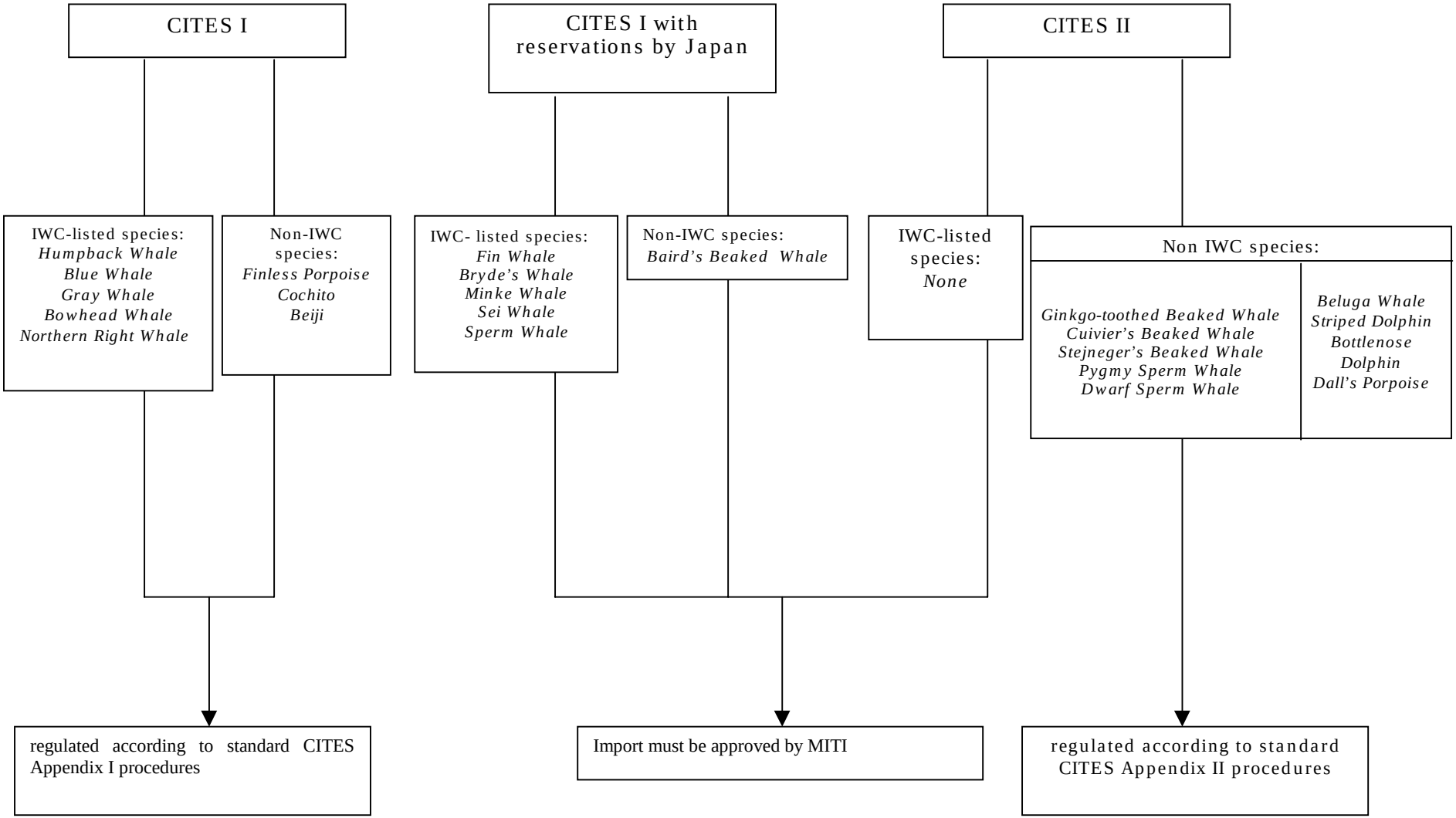
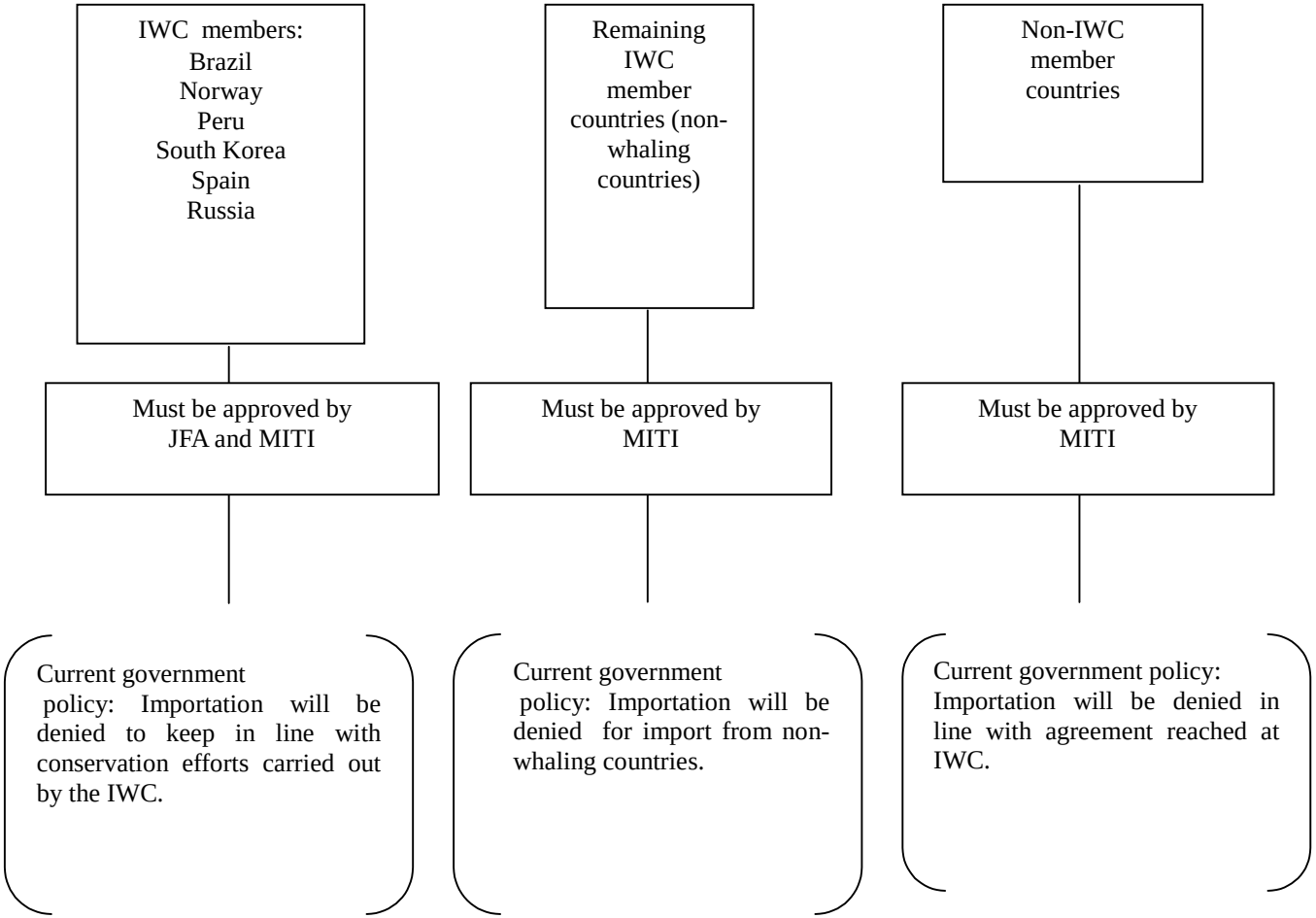


Figure 6
Regulations governing import of whale products in Japan:
Import approval by exporting countries



Discussion and conclusions

TRAFFIC East Asia has examined the current status of commercial trade in whale products within Japan. In particular, analysis of trends in consumption (both volumes and prices) and of long-time stocks of whale products was carried out in some detail. Japan's domestic regulatory framework was also examined.

Consumption of whale meat

There are currently five legal sources of supply for whale products (including whales, dolphins and porpoises) in Japan: scientific (research) whaling, small-type coastal whaling, drive and hand harpoon fisheries, incidental take and strandings, and long-time stocks. In the past, 'dolphin' products (i.e. from small cetaceans) comprised a substantially different market from 'whale' products, but market research by TRAFFIC found dolphin products on sale in major urban centers. The halt in commercial whaling appears to have resulted in demand for 'dolphin' products as a substitute for 'whale' products.

Overall, Japan's frozen stocks of whale products have steadily decreased over the years. At the end of March each year, Japan had 22 157 tons of frozen stocks of whale products in 1980, 10 786 tons in 1987, 2 042 tons in 1992 and 1 121 tons in 1997 (Anon., 1976~1997). Judging from annual supply figures and trends in stocks, whale products consumption (including species not covered under the IWC moratorium) appears to have been in the range of 3000~4000 tons annually for the four-year period 1995-1998.

Trends in whale meat prices

TRAFFIC found a logarithmic function that shows a significant fit with the trends in prices (see ***Trends in whale meat prices*** section). The function estimates equilibrium prices at the wholesale market level, for a given quantity supplied that year. For example, a 1% increase (decrease) in whale meat supply would result in a 0.34% fall (rise) in its transaction price at the wholesale market level.

The supply of fisheries products such as whale meat, unlike that of manufactured products, often is not elastic (i.e., responsive) to price changes. That means that supply curves are vertical rather than upward sloping, and shift horizontally to reflect changes in number of whales caught for a given year. Assuming that supply curves have been vertical and demand conditions were fairly unchanged during a sample period, the function can also be interpreted as the market demand function.

However, this assumption might not hold. It is possible that changes in demand conditions have shifted demand curves over the years. One example of how demand conditions might have changed over the years is the reduction in overall consumption of fisheries products by Japanese households nowadays compared to 20 years ago (Anon., 1977~1998). This analytical uncertainty must be kept in mind when interpreting the results.

The technical and economic feasibility of long-term storage

It appears that, despite some technical difficulties, whale meat could be stored for more than ten years without damaging its taste or flavor too much. However, deciding objectively how long whale meat could be stored would be an exceptionally difficult task. Research would be time-consuming and no standard universal measures of freshness, taste, or flavor exist.

The economic feasibility of long-term storage was examined using a standard economic framework (see ***Economic feasibility of long-term storage*** section) and was found to be possible. However, perfectly rational inter-temporal choice is hard to come by, not least because people are not so forward-looking as economic theory suggests. While it is possible that long-term storage of whale meat is economically a rational behavior, it is also worth noting that the two wholesalers with Fin Whale stocks said that they were holding old stocks for cultural reasons, rather than for profit concerns. They are keen on preserving the legacy of what they see as an important part of Japanese culture, and they also stressed that there was an element of pride linked to dealing in the meat.

The regulation of international trade

Import of most whale products is specifically regulated under Japan's Decree of Import Trade Control. Import must first be approved by the Ministry of International Trade and Industry (MITI) before standard CITES import procedures begin. Any importation that threatens the conservation efforts carried out by the IWC will be denied (Anon., 1991a). Under current Japanese policy, the government will allow imports only from trade between IWC member countries (see ***International trade*** section).

No specific regulations are in place to regulate whale products trade within Japan. However, in cases where smuggling is proven to have taken place, the Customs Law and the Foreign Exchange Control Law of Japan can be enforced to prosecute smugglers. These laws can be applied even when the products have already crossed national boundaries and have been traded or stored within the country for some time.

The listing proposals for stocks of minke whales put forward for consideration at CITES COP11 by the Japanese Government state, "Imported products will (also) be subject to a DNA monitoring and control system in order to prevent possible illegal trade"(Anon., 1999b). Currently, Customs officers cross-check import applications with DNA techniques when they feel it necessary. Sampling is discretionary and is done for the purpose of confirming the authenticity of permit information on the species origin of given whale products.

Monitoring and regulation of the domestic market

CITES *Decision 10.40 (b)* encourages all member countries to "collect and inventory skin or meat samples for DNA identification" for "all frozen whale parts and derivatives possessed in commercial quantities." *Decision 10.41 (c)* urges all countries concerned to "collect and inventory skin or meat samples for DNA identification," from baleen whales "taken incidentally to other fishing operations, and if any specimens from these whales will be entered into commerce."

In addition, the supporting statements to the Japanese Government's proposals to transfer various whale stocks from Appendix I to Appendix II state that precautionary measures are fulfilled through national conservation and management measures and establishment of a trade control system based on DNA analysis techniques.

It is technically possible to identify the species by employing DNA analysis techniques, as was done by TRAFFIC in 1997 (Phipps *et al*, 1998) and by other organizations and agencies (JFA, 1997; Baker *et al*, 1996, 1996b, 1999). However, previous TRAFFIC reports have highlighted some of the potential problems in effective monitoring of the commercial trade in whale

products using DNA analysis in a complex multi-species market such as Japan's (Mills *et al*, 1997; Phipps *et al*, 1998). Work done by TRAFFIC in Japan has identified shortcomings in the current domestic management system's ability to distinguish between legal and illegal whale meat in the marketplace as inclusion of samples from frozen stocks, incidental catch and strandings in the register is not mandatory. In Japan, a DNA register could provide an effective tool for monitoring whale meat stocks only if samples from all legitimate sources of whale meat were to be included.

Currently, samples for genetic analysis are collected from every specimen of minke whale harvested as part of Japan's scientific whaling operations in the Antarctic and North Pacific regions. Government notifications request collection of samples from specimens of baleen whales and Sperm Whales stranded or caught as bycatch in national waters. However, this collection is not mandatory. Samples from long-term stockpiles of whale meat acquired prior to commencement of the IWC moratorium (1986) or prior to Japan's decision to halt imports of whale meat (1992) are not part of the current DNA register. Although the JFA has plans to expand the DNA register to include samples from long-term stockpiles, no details on how this would be carried out have been made public to date.

Recommendations

TRAFFIC proposes the establishment of a comprehensive DNA register within Japan for whale species covered under the IWC moratorium, encompassing not only “by-products” from scientific whaling, but also imported products, incidental catch and strandings, and frozen stocks. For domestic trade management purposes, DNA profiling for all imported whale products is desirable. DNA profiles stored in a databank could then be utilized for the monitoring of domestic trade in whale products to determine if products are from a legal source.

Inclusion of frozen old stocks could be achieved by setting a time limit for either selling off existing products or submitting a tissue sample for DNA profiling. Incidental takes should not be overlooked albeit the amount supplied from this source would likely be very small in quantity. Reporting of incidental catch and strandings of baleen whales and Sperm Whales as well as submission of tissue samples should be mandatory and supported through legal penalties for violations. This framework would be a powerful tool in achieving an effective monitoring of trade in whale products.

TRAFFIC found 76 whale products samples in the Tokyo and the Hanshin areas (see ***Whale meat at the retail level*** section). Of the 76 samples, species or origins of the products were not specified for 50 samples. From an overall management perspective, it would be appropriate to support the DNA register by requiring sellers of whale products to label products to indicate the species and geographic origin. Such a label would complement DNA analysis techniques in confirming product status, and make monitoring of trade in whale products far easier to implement in practice.

From the point of view of retailers and consumers, such a labeling system would also be desirable. It is worthwhile to note that several retailers complained about dolphin products (characterized as being significantly inferior in taste to minke whale products) being mixed with other products in the distribution chain. DNA analysis of samples collected by TRAFFIC in earlier market surveys also found a significant number of samples contained meat from small cetaceans (Phipps *et al*., 1998).

TRAFFIC recommends that the Government of Japan undertake the following actions for whale

species covered under the IWC moratorium:

- Institute a mandatory policy for imported whale meat requiring submission of a tissue sample for DNA profiling and inclusion in a DNA register.
- Incorporate long-time frozen stocks into the DNA register by setting a time limit for either selling off products or submitting a tissue sample for DNA profiling.
- Institute a policy requiring the mandatory reporting of incidental catch and strandings of baleen whales and Sperm Whales as well as submission of a tissue sample for DNA profiling and inclusion in the register.
- Support the mandatory system for tissue samples submission through legal penalties for violations.
- Institute a mandatory system requiring sellers of whale products to indicate species and geographic origin of products with a label.
- Assign responsibility for market sampling and maintenance of the DNA register to an independent third party.

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