JAPAN: Progress Report on the Killing Method of Whales in the Second Phase of Japanese Whale Research Program in the Antarctic Sea (JARPAII) and Northwestern Pacific Ocean (JARPNII)

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Japanese Whale Research Programs have been conducted since the 1987/88 season in the Antarctic Sea (JARPA and JARPAII) and since the 1994 season in the Northwestern Pacific Ocean (JARPN and JARPNII). Since these programs adopt lethal methods, whale killing methods have been examined and improved with a special interest in reducing the time-to-death (TTD) and increasing the instantaneous death rate (IDR) of whales.

Improvement of the whale killing method has been conducted based on the IWC Action plan developed at the workshop on whale killing method in 1992 (revised in 1995 and 1999). This action plan especially encouraged improving whaling equipment and methods to reduce TTD.

Japan has been collecting catch records including TTD for all whales taken by sampling vessels (catcher boats). Necropsies (gross anatomical observation) of whale carcasses have been conducted by a veterinarian or an experienced biological researcher on the research base ship. The necropsy record includes the hit point and internal track of the whaling harpoon, explosive point of the grenade, examination of the harpoon wounds and the effect of bullets used for the secondary killing method.

All data was accumulated and analyzed so as to improve killing method of whales. Gunners and crews of sampling vessels are briefed at a pre-cruise meeting on the analysis of the past research for the killing methods and are encouraged to achieve the shorter TTD and higher IDR. During the research cruise, the latest necropsy records obtained by a researcher on the research base ship is sent to the gunners on the sampling vessels as soon as possible so that they can review in detail the results of their shots while their memories are still fresh. Firing accuracy has been improved as gunners gain knowledge about the most preferable firing angles and shooting areas in the whale body by combining their experience with the anatomical and medical data from a researcher on the research base ship. This rapid-analysis and data-feedback system has been considered as the main reason for the successful improvement of TTD and IDR in the Japanese whale research (Ishikawa, 1999).

Improvement of whaling devices also contributed to reduce TTD. Large caliber rifle with solid bullets as the secondary killing method was introduced since 1996. As handling of rifles was easier than that of electric lances previously used, introduction of the rifle shortened TTD significantly. Since 2002, Japan introduced an improved grenade with refined fuse. It explodes shorter distance after a harpoon hits the whale body with little misfiring than Japanese old grenade. Comparative experiments with Norwegian new grenade, Whalegrenade-99, showed both Japanese improved and Norwegian grenades reduced TTD and increase IDR significantly compared to the Japanese old grenade (Ishikawa, 2007).

This document reports major efforts and results on the whale killing method mainly from 2005 to 2008 season in the Japanese whale research (JARPAII and JARPN II).

IMPROVEMENT OF WHALING DEVICES

Replacement of sampling vessels

Kyodo-Senpaku Co.Ltd, owner of research vessels, newly built and replaced three sampling vessels from 1999 to 2007. Building of pelagic whaling boat was the first time in 26 years in Japan. New vessels, Yushin-Maru series (No 1-3) are equipped 5280ps main engine and variable pitch propeller. They also have a 75mm whaling cannon with two whaling winches, and developed whaling sonar as whaling devices. Introduction of new whaling vessels made easy to chase whales and increased shooting chances for gunners, resulting high shooting accuracy and improved TTD.

Design of Harpoon head

In purpose of reducing struck and lost, the design of the harpoon head was modified. The struck and lost was occurred by reason of losing out of a harpoon or breaking line of the harpoon. During the course of the investigation on reason of the struck and lost, it was suggested that in some cases a harpoon line was cut by large shrapnel of the grenade inside the body of a whale. As an ordinal steel head of the explosive harpoon remained large shrapnel after explosion, design of the steel head was modified so as to remain relatively uniform sized and light shrapnel after explosion (Fig.1).

Fig. 1. (Upper) The traditional style harpoon head and shrapnel after explosion. A large shrapnel with a heavy weight was left in the whale body frequently. It sometimes cut harpoon line and caused "struck and lost". (Lower) Improved harpoon head produces fewer and smaller shrapnel than the traditional one, which is expected to reduce possible struck and lost.

Whaling devices for larger whale species

With the second phase of JARPA and JARPAN, larger whales than minke whale were targeted for lethal research. Whaling devices for fin, sei, Bryde's and sperm whales were considered and increased penthrite explosive, delayed fuse and larger caliber rifle (.458) were introduced. Table 1 summarizes primary and secondary killing devices for each target species.

Improvement of grenades for coastal whaling vessels

Since 2002, small type whaling catcher boats took part in the coastal operation in the JARPN II research. Although these catcher boats were equipped 50mm whaling cannon and small sized grenades (7g penthrite), it was concluded that the small penthrite grenades were insufficient to kill minke whales as quickly as 30g penthrite grenades that were used in the offshore operation. Improvement of the grenade for small type whaling catcher boats was conducted from 2004 to 2006. Newly developed grenades consist of 27g penthrite with refined fuse and short type steel head similar to the figure deployed for large sized grenades (see "*Design of Harpoon head"*).

Recruitment of new gunners

Cadets for gunners were recruited in 2004. Three excellent crew of the sampling vessel were selected as gunner trainees and were getting experience year by year. In the 2007 JARPNII, 25 minke whales and 15 Bryde's whales were taken by the three gunner trainees.

Table 1. Summary of primary and secondary killing devices for target whale species.

	Primary killing method (grenade)	Primary killing method (fuse)	Secondary killing method	Remarks
Fin whale	75mm harpoon with 60g penthrite explosive	0.1sec./0.05sec. delayed	Second harpoon with 60g penthrite explosive	Rifle is not effective as the secondary killing method.
Sei whale	75mm harpoon with 60g/50g penthrite explosive	Ditto.	Second explosive harpoon and large caliber rifle (.458)	Penthrite amount and fuse was selected by estimated body length.
Sperm Whale	Ditto.	Ditto.	Second explosive harpoon with 60g/50g penthrite explosive	Rifle is not effective as the secondary killing method.
Bryde's whale	75mm harpoon with 50g/30g penthrite explosive	0.05sec. delayed or 0sec.	Second explosive harpoon and large caliber rifle (.458/.375)	Penthrite amount and fuse was selected by estimated body length.

(Antarctic) minke Whale	75mm harpoon with 30g penthrite explosive	0sec. fuse	Second cold harpoon or large caliber rifle (.375)	50mm explosive harpoon is used for coastal operation.

Results of the 2005/06, 2006/07 and 2007/08 JARPAII

The JARPAII was conducted in the eastern part of Area III, Area IV and western part of Area V in the 2005/06 and 2007/08 season, whereas in the Area V and western part of Area VI in the 2006/07 season. Although 850 Antarctic minke whales and 10 fin whales were planned to be taken in each season (50 fin whales in 2007/08), it was not achieved because a fire accident on the research base ship (2006/07) and violent interruption by anti-whaling groups (2007/08). Ten and three fin whales were taken in the 2005/06 and 2006/07 season respectively, whereas no fin whale was taken in the 2007/08 season.

Table 2 shows the TTD and IDR information in the 2005/06, 2006/07 and 2007/08 seasons. The data for fin whales was excluded because of insufficient number of data for analysis.

Table1. TTD and IDR in the 2005/06, 2006/07 and 2007/08 JARPAII.

Season	*Species*	*Total number*	*Time to death* (TTD)			*Instant death rate* (IDR)
			MED	MEAN	S.D.	
2005/06	Antarctic Minke whale	853	0:00	2:06	3:37	50.3 %
2006/07		505	2:00	2:26	3:57	40.6 %
2007/08		551	0:00	1:57	2:33	51.0 %

Results of the 2005, 2006 and 2007 JARPNII

The 2005, 2006 and 2007 JARPNII were conducted in the western North Pacific. For offshore operation, 100 minke whales, 50 Bryde's whales, 100 sei whales were taken in each season. Five, six and seven sperm whales were taken in the 2005, 2006 and 2007 season, respectively. Table 3 shows the TTD and IDR information in the 2005, 2006 and 2007 seasons. The data for sperm whales was excluded because of insufficient number of data for analysis.

Table 2. TTD and IDR for minke Bryde's and sei whales in the 2005, 2006 and 2007 JARPNII. Total number of minke whales in the coastal operation was combined with two surveys (in Sanriku and Kushiro region) in a year.

Season	*Species*	*Total number*	*Time to death* (TTD)			*Instant death rate* (IDR)
			MED	MEAN	S.D.	
2005	Minke whale (offshore)	100	2:30	2:32	3:02	40.0 %
2006		100	1:30	2:01	2:36	44.0 %
2007		100	0:55	3:02	6:11	50.0 %
2005	Minke whale (coastal)	120	5:20	6:13	7:16	32.5%
2006		95	3:10	6:42	14:23	43.2%
2007		106	1:45	4:42	6:52	47.2%
2005	Bryde's whale	50	2:15	2:25	2:56	42.0 %
2006		50	2:25	2:14	2:13	40.0 %
2007		50	0:00	2:23	3:11	54.0 %
2005	Sei whale	100	3:20	3:59	4:21	38.0 %
2006		100	2:40	3:43	4:52	42.0 %
2007		100	3:55	4:54	5:24	34.0 %

References

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