



ASSESSING WAYS OF REDUCING THE RATE OF DEVIATIONS IN THE HUNTING OF FIN WHALES

Report from a Task Force appointed by
the Minister of Food, Agriculture and
Fisheries



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English translation of the Report From a Task Force Appointed by the Minister of Food, Agriculture and Fisheries published in August 2023

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ISBN 978-9935-551-01-6 Assessing Ways of Reducing the Rate of Deviations in the Hunting of Fin Whales (electronic version)

Issuer:

Ministry of Food, Agriculture and Fisheries

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FEBRUARY 2024

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Layout and text:

Ministry of Food, Agriculture and Fisheries / Department of Fisheries

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Summary

On July 11th, 2023, a task force was appointed as per the Minister of Food, Agriculture and Fisheries' decision, with the aim of evaluating possible ways to reduce the rate of deviations in fin whale hunting. The Task Force was appointed following the enactment of Regulation no. 642/2023 which amended the regulation on whaling and is a continuation of the work that was initiated prior to the opinion of the Council of Specialists. The Task Force was instructed to review existing proposals for remedial action with regard to the equipment and methods used for fin whale hunting and, where appropriate, to examine other approaches, which the Task Force might consider warranted. Upon completion, the Task Force was to submit proposals for viable alternatives or solutions to the Minister of Food, Agriculture and Fisheries.

The Task Force included experts from the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority; as well as being supported by external experts to assess those proposals that had already been presented. The Task Force has now completed its task by submitting this report. The primary conclusions of the report are as follows:

- The Task Force concludes that it is possible to improve whaling methods for the hunting of large whales.
- The Task Force has concluded that the submitted proposals and the improvements they aim to induce are likely to have an effect on the success of whaling efforts.
- The Task Force has determined that one cannot rule out the possibility, considering the descriptions of the different methods that have been assessed, that whaling with modified methods will be more successful than older methods in mitigating the rate of deviations, when considering their possible cumulative effect.

As the scope of the Task Force's undertaking is inherently extensive, and studying new and improved whaling methods is time-consuming, it should be noted that the conclusions of the report are based on available information, as well as additional information that could be obtained within the designated time period. This should be taken into account when interpreting the conclusions and assessments of the Task Force.

Reykjavik - August 28th, 2023.



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1. The premise and work of the Task Force

1.1 Background

Issues related to whaling have been under review by the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority; particularly since efforts first began to amend the implementation of whaling controls for the 2022 season, and the Ministry of Food, Agriculture and Fisheries has published a brief on the key aspects, reports, memos etc. that have been reviewed during the undermentioned period.

It was the Ministry's assessment that Icelandic whaling did not meet the statutory requirements and that this necessitated a response. The Minister of Food, Agriculture and Fisheries therefore decided to formally establish a Task Force on behalf of the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority; to address this issue. The Task Force is appointed as follows:

Jón Þrándur Stefánsson; the Ministry of Food, Agriculture and Fisheries; Chairman,
Ásgerður Snævarr; the Ministry of Food, Agriculture and Fisheries,
Þóra Jóhanna Jónasdóttir, the Icelandic Food and Veterinary Authority – the alternate is Sigurborg Daðadóttir, the Icelandic Food and Veterinary Authority,
Elin Björg Ragnarsdóttir, Directorate of Fisheries— the alternate is Þórarinn S. Traustason, Directorate of Fisheries.

Katarina Tina Nikolic, staff member at the Ministry of Food, Agriculture and Fisheries, recorded the minutes at Task Force meetings.

In the opinion of the Council of Specialists on animal welfare, the Council formed a position *vis-à-vis* a portion of the variables which the Ministry had previously considered to include in a regulation to reduce the number of deviations during fin whale hunting. As previously stated, the Council of Specialists did not consider external factors, such as climatic conditions and wave height, to have had a decisive impact on the effectiveness of the whaling method. It furthermore considered that there was no significant difference between hunters and that, even when the animal was hit in the recommended target area, this would not guarantee the rapid loss of consciousness or quick death of the animal. However, the Ministry considers it necessary to re-submit these questions to experts, with the view of trying to establish, among other things, whether it is possible that the synergetic effect of these factors might have a significant impact on the efficiency of Icelandic whaling.

According to the letter of appointment, the role of the Task Force was therefore as follows:

The Task Force is to review the proposals previously presented, provide additional proposals as necessary, submit proposals for viable alternatives or solutions, and consult with external experts as needed.

Since Regulation no. 642/2023 was enacted, every effort has been made to seek viable means of making improvements upon the equipment and methods used in fin whale hunting, so that whaling efforts may adhere to the standards of law and animal welfare concerns. Although that work has been expedited as much as possible, as the temporary provision of the Regulation expires on September 1st, 2023, it is evident that the project is inherently extensive and time-consuming.

Therefore, no time was wasted in seeking out experts that could to assist the Task Force in this project.

When examining the field of whaling and the experts who have participated in studies relating to animal welfare and whaling methods, it should be noted that there is not a large number of experts in this field and, in many cases, those parties will have been employed for stakeholders at some point in time, or have had other forms of vested interest in whaling. Thereby, parties may have previously advanced views on specific issues related to the Task Force's deliberation or been employed as consultants for stakeholders. The same also applies to representatives of the relevant agencies and the permit issuer, who have been involved with issues relating to whaling. The Task Force is aware of such vested interests and has taken steps, as far as possible, to take these factors into consideration when deliberating on individual proposals. The Task Force has endeavored to address the subject on a professional basis, without allowing vested interests, previous statements or sentiments to affect the proceedings or the Task Force's ability to provide a professional deliberation. Nevertheless, conclusions should be considered in the light of the fact that access to experts in this field is extremely limited and the time frame very narrow. This has affected the Task Force's ability to comprehensively examine all aspects of the disputed issues, which were under deliberation.

The Task Force convened a total of 21 times, in addition to meeting with stakeholders and experts to consult on certain issues.

Although the work of the Task Force was somewhat constrained, with regard to the reviewing of proposals, other matters of dispute related to the work of the Task Force arose upon examination, and it is appropriate to address those issues, as they may also influence decision-making based on the Task Force's observations.

1.1.1 The report of the Icelandic Food and Veterinary Authority and a deliberation from the Council of Specialists on Animal Welfare

The year 2022 saw the first official controls on whaling, with detailed listings of factors that could affect the welfare of the animals during whaling, along with video recordings, captured by inspectors on board the vessels. The controls were carried out on the basis of Regulation no. 917/2022, regarding the monitoring of animal welfare in the hunting of whales, and the aim of enacting the regulation was to promote the welfare of the animals through increased controls and data collection.

The conclusions of the monitoring efforts were published in the report of the Icelandic Food and Veterinary Authority dated May 8th, 2023. Those conclusions showed that up to 41% of the animals were not successfully put to death in a quick and relatively painless manner. Those conclusions, moreover, showed that the percentage of animals shot with more than one harpoon was 24%, and that the animals' death throes lasted up to two hours. After reviewing the data obtained through monitoring efforts, including video recordings of whaling efforts, registration forms of hunting observers, and comments from a land-based veterinarian on matters such as organ injury, while also taking into account other available data on equipment, whaling methods and the training of personnel, the agency was not prepared to state what the primary cause of the deviations was, and concluded that likely there were multiple factors at play. Thus, the deviations could not be sufficiently tied to the conduct of individual hunters, the whaling equipment, or the license holder in other ways, and it was not apparent that external factors such as lighting conditions, visibility, wind conditions or wave height impacted the results in significant ways.

Because of the findings from these monitoring efforts, the Icelandic Food and Veterinary Authority commissioned a Council of Specialists on animal welfare to review the available data, to assess whether it would at all be possible for whaling to meet the objectives of the Animal Welfare Act.

In the opinion of the Council of Specialists on animal welfare, dated June 16th, 2023, the Council concluded that there had been major failings in the hunting of large whales off the coast of Iceland in the summer of 2022. It was the Council's assessment that there was nothing unique about the conditions during this hunting season that could explain those failings, and therefore one might expect that the results of this year's hunt would be no different from previous hunting seasons. Based on the available data and what was stated in the communication undertaken by the Council of Specialists with experts, the Council considered that the conditions necessary to ensure animal welfare could not be fulfilled during the killing and hunting of large whales. The Council's conclusion was therefore that the whaling method used during the hunting of large whales was not compatible with the provisions of Law no. 55/2013 on animal welfare.

The main criteria considered by the Council of Specialists when forming a resolution are cited in the statement attached to the Council's opinion. Firstly, the Council considered that, even when the shooting was successful and the animal was hit in the recommended target area, this did not always guarantee a rapid loss of consciousness or a quick death for the animal. Secondly, it could neither be established that external factors such as weather conditions and wave height had had a deciding effect on the efficiency of the whaling method, nor that there had been a significant difference in results depending on which shooters were involved. Thirdly, it was revealed that it might take approximately seven minutes to reload a harpoon gun, which would mark the minimum time needed to fire another shot, should a whale not lose consciousness or be killed on the first shot. The time it takes to get back into range comes in addition to that, further prolonging the time between shots. If animals that did not die immediately or very quickly needed to be shot again, the time that elapsed before another shot was fired was at least 10 minutes and up to 22 minutes in the sample of hunts monitored during the 2022 hunting season. Some of the animals were also shot three times (5 animals) and four times (4 animals) before they were successfully killed.

Furthermore, the statement of the Council of Specialists asserted that other mandatory conditions governing the shooting of wild mammals could not be met when hunting large whales. It states, among other things, that the experts who met with the Council had concluded that the whale's sex could not be determined from the hunting vessels, nor could it be determined whether a hunted female was pregnant or lactating, or accompanied by a calf, and that the chances of survival for motherless whale calves were next to none.

Lastly, the Council of Specialists observed that it would be difficult to manage the hunting of whales better in light of the size of the animals and the hunting conditions, namely that the animals were mostly submerged, the ships were in constant motion, and that reloading the guns was time-consuming.

It was the Ministry's assessment that findings from the monitoring of whaling in the year 2022 indicated that existing whaling methods and whaling equipment were subject to deficiencies of a nature that impeded whaling methods, in their current form, from being carried out in accordance with the requirements resulting from the Animal Welfare Act and the Whaling Act. The Ministry, however, did not accede to the position of the Council of Specialists that the hunting methods could not be improved. In the Ministry's view, it was not possible to assert, without further investigation, that it is impossible to conduct whaling without adhering to regulations. To this end, the Minister of Food, Agriculture and Fisheries appointed a task force with the aim of investigating whether, and in which ways, it was possible to reduce the rate of deviations in fin whale hunting.

1.1.2 Consultation with the license holder

Via a letter submitted by the Ministry to Hvalur hf., dated June 20th, 2023, the proposed restriction on the 2023 hunting season for fin whales was announced. Furthermore, it was announced that the Ministry would explore possible remedial measures and other available methods of whaling, in consultation with experts and the license holder. By letter from the Ministry, dated July 10th, 2023, the company was informed that the Ministry had established a task force with representatives from the Ministry; the Icelandic Food and Veterinary Authority; and the Directorate of Fisheries; to further delineate the parameters that might come under review, and that this Task Force would be submitting proposals for possible solutions to the Ministry. The Company was given an opportunity to submit to the Ministry available data and information and, as appropriate, any comments or considerations it considered necessary to communicate at this stage.

Hvalur hf. responded to the Ministry of Food, Agriculture and Fisheries' communication with a letter dated July 12th, 2023. The letter requested further details on the names and positions of representatives in the Task Force, in order for the company to communicate any possible concerns regarding their eligibility. It should be noted that no comments were received regarding the eligibility of individual representatives of the Task Force. It was then requested that Hvalur be admitted to take part in the work of the Task Force, as the company was the only entity authorized to engage in whaling within Iceland, the company has significant vested interests, and Hvalur hf. could provide considerable expertise and experience regarding the matter.

The message from Hvalur hf. included a memo from Tensor ehf., dated July 10th, 2023, where details were provided regarding the remedial actions which Hvalur had either already completed or were underway. That memo states that whaling and whaling methods had been monitored during the summer of 2022 with the aim of discovering ways of improving hunting practices and to increase the efficiency of the hunt. Particular attention had been paid to lines, harpoons, sights and reloading time. The memo identified nine points that had been addressed: sights, harpoon coupling, firing line, firing line basket, estimating the range, powder blend, changes to the orientation of projectiles, the use of electricity during killing, and crew training. Below, further details will be provided regarding each individual proposal, followed by the Task Force's assessment.

The Task Force was permitted to inspect the whaling vessels on August 15th, 2023 in order to inspect the conditions on board and better examine and understand the function of whaling equipment and whaling methods. The representatives of Hvalur hf. assisted the Task Force and responded to inquiries made by its members. Following that, a meeting was held with representatives of Hvalur hf., where the Task Force received a more in-depth presentation on proposed remedial actions.

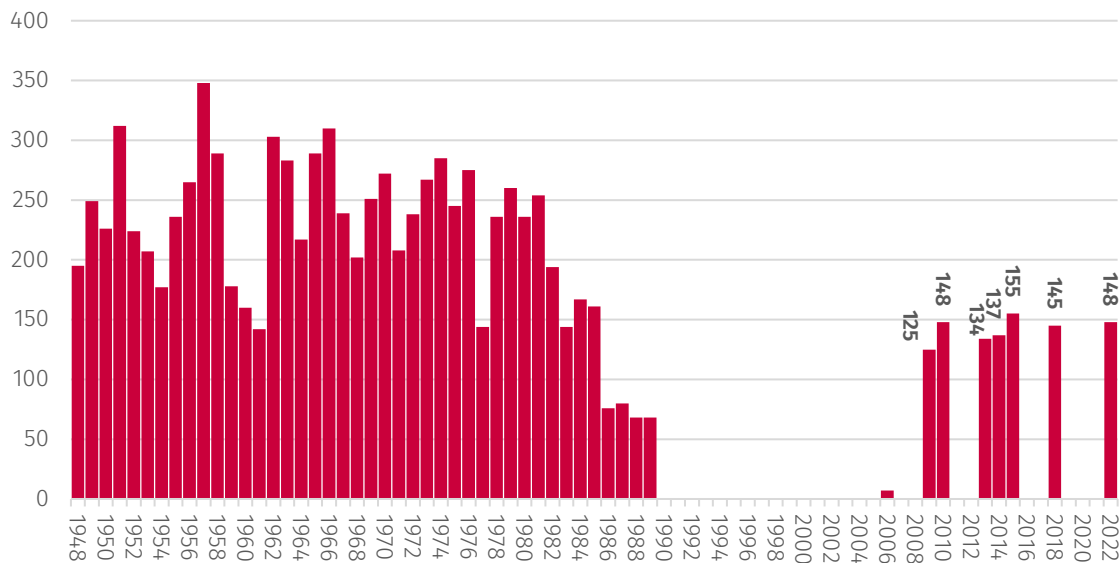
2. General information on whaling

2.1 Fin whale hunting off the coast of Iceland

It can be said that Icelanders first began commercial whaling around the middle of the last century, when the whaling station in Hvalfjörður was put into operation. Over the past centuries, whaling in the fishing waters around Iceland had primarily been pursued by companies owned by foreign entities. In 1915, whaling was finally banned and not permitted again until 1928. Iceland joined the International Whaling Commission (IWC) in 1946 and approved the International Convention for the Regulation of Whaling two years later. Regulated commercial whaling began that year, including the whaling of fin whales. In 1948-1985, an average of 234 fin whales were hunted annually, i.e. up until the IWC's temporary ban on commercial whaling came into force in 1986.

Commercial fin whale hunting began again when a new hunting permit was issued in 2009. From that time until 2022, only half of the hunting season has been devoted to the hunting of fin whales. Fin whales have been hunted for 7 years during that period and there have been 7 years where no fin whales were hunted, as seen in Image 1.

Image 1 - The number of fin whales hunted during the period of 1948-2022



Source: A summary by the Ministry of Food, Agriculture and Fisheries based on data from Statistics Iceland.

As whaling activities have not been pursued continuously over extended periods, it is possible that this has affected the increased rate of deviations in whaling. Such an effect could occur when the experience of whalers and the use of equipment is not maintained in the same way it would have been if whaling had been pursued on a continuous basis. Therefore, limited continuity in whaling may necessitate providing crews with additional training to compensate for any effect this may have had. This is not addressed at any point in the laws or regulations pertaining to whaling. However, it cannot be overlooked that a permit for whaling was in place during the aforementioned period. Therefore, the company is entirely responsible for the decision not to pursue whaling efforts. There may be a number of factors underlying that decision, and that decision may be made due to operational concerns or market conditions at the time. It is clear that it may affect the success of whaling efforts if they are not consistent over a long period.

Image 2 - Hvalur 8 RE-388 and Hvalur 9 RE-399

Source: Photos by Wolfgang Fricke, taken on November 8th, 2021 and published under a GNU Free Documentation License.

Custom-built vessels are used for whaling off the coast of Iceland. These ships are Hvalur 8 RE-388 and Hvalur 9 RE-399 (Image 2), both of which were built in Norway, in 1948 and 1952, respectively. The design of the ships leads to certain restrictions on what kind of equipment can be installed and which modifications can be made. Consequently, only one harpoon gun can be installed in each vessel and only two fixed firing lines can be used on board. Both of these vessels have been well maintained and modifications have been made to install other equipment within the constraints imposed by the design of the vessels.

2.2 Conditions during hunting of fin whales

Whaling involves the hunting of wild mammals in their natural environment. Whaling conditions vary from time to time and therefore it is necessary to adapt to environmental conditions which cannot be controlled. It follows that the setting for whaling differs significantly from conditions in which environmental factors can be controlled, such as the slaughtering of livestock. Therefore, one could say that whaling is in some ways analogous to the hunting of wild mammals on land.

However, it cannot be ignored that the size of these animals, and the fact that the hunt takes place at sea, where the animals are mostly submerged, affects the setting for the hunt. Fin whales are much larger than minke whales, which are the most common target for whalers. Therefore, the whaling methods need to be adapted with that in mind. Furthermore, the animals are further from land, where sea and weather conditions can have a disruptive effect on whaling efforts.

Most research on whaling in recent years has centered on minke whale hunting, whether it is research related to animal welfare or research on whaling methods. As far as research on whaling methods is concerned, it is by no means evident that the hunting methods being employed in the hunting of minke whales will yield the same result for the hunting of fin whales. Due to different conditions, this has been met by adapting the equipment used in whaling, such as by taking into account the size of animals. Therefore, larger whaling guns are used to hunt fin whales, guns which are made to accommodate larger harpoons and more explosive material than would be used in minke whale hunting.

Furthermore, during the hunting of minke whales, it is also possible to employ firearms as a backup, to ensure the speedy death of the animals. However, comparable hunting methods are not applicable to the hunting of fin whales, due to the size of the animals. Such firearms would need to be sufficiently powerful

for animals of this size and could therefore be in a hazard category far beyond what can be considered acceptable for the hunters or others in the vicinity of the hunt. There are further difficulties in towing the animal to the side of the vessel, immediately following the use of a harpoon grenade, to shoot it again with a firearm. Therefore, the use of such firearms as a backup cannot be considered feasible. A distinction must be made, both between the whaling methods, as well as hunting conditions, when comparing the hunting of fin whales to minke whales.

In the Task Force's interviews with the inspector who performed the inspections during the 2022 hunting season, it was stated that it was possible that the presence of a third party at sea might negatively affect the outcome, and thereby exacerbate deviations during whaling. In this case the activities of the third party may cause stress or fatigue during the whaling efforts, which in turn can affect the outcome. The scenario being discussed, was if the vessel of a third party were to pursue the whaling vessel or attempt to disrupt whaling efforts, triggering a response from the whalers, which could potentially be stressful for the crew, and thereby increase the likelihood of deviations. This is not easy to assess but, on the other hand, it is not possible to rule out that this would have an impact. During the 2022 season, Hvalur 8 was pursued during a hunt, and it is likely that this affected whaling efforts, as noted in the assessment of conditions submitted by the inspector from the Directorate of Fisheries. It is not easy to see how exactly this would impact whaling efforts, but if present, the impact might reduce the success of the hunt and thereby lead to deviations.

2.3 The international debate concerning animal welfare in whaling

Animal welfare in whaling has been a major topic of discussion internationally over the past few decades, and the International Whaling Commission (IWC) and the North Atlantic Marine Mammal Commission (NAMMCO) have weighed in on the issue through committees that are focused on discussing whaling methods. In this context, workshops have been staged and action plans created which are aimed at improving whaling methods and hunting equipment and shortening the TTD¹. Despite this work, there are no standards for what constitutes an acceptable TTD.

Additionally, determining the TTD for large whales poses unique challenges, as the scale of whaling has decreased considerably and commercial whaling is now confined to Iceland, Norway and Japan. There is no comparable data on TTD or the ratio of whales that are killed immediately, despite the fact that previous decades saw large scale commercial whaling aimed at large whales.

Although the IWC established a committee² in 1959 to examine hunting methods and conduct research in this area, its work was limited to a discussion on the use of electric harpoons and carbon dioxide for the hunting of large whales (Ole Øen, Egil 2021). It may be said that there were no significant advances in whaling methods until the 1980s, when work began on developing whaling methods that would supersede the non-explosive harpoon used to hunt minke whales, along with Japanese experiments concerning the use of penthrite in harpoon grenades, which began in 1979. The current Hvalgranat-99 model was put into operation in the year 2000, as part of minke whale hunting in Norway.

¹ TTD (Time To Death) is an abbreviation used to determine how long it takes for the animal to be successfully killed.

² The English name for the committee is "The Working Party on Humane and Expeditious Methods of Killing Whales."

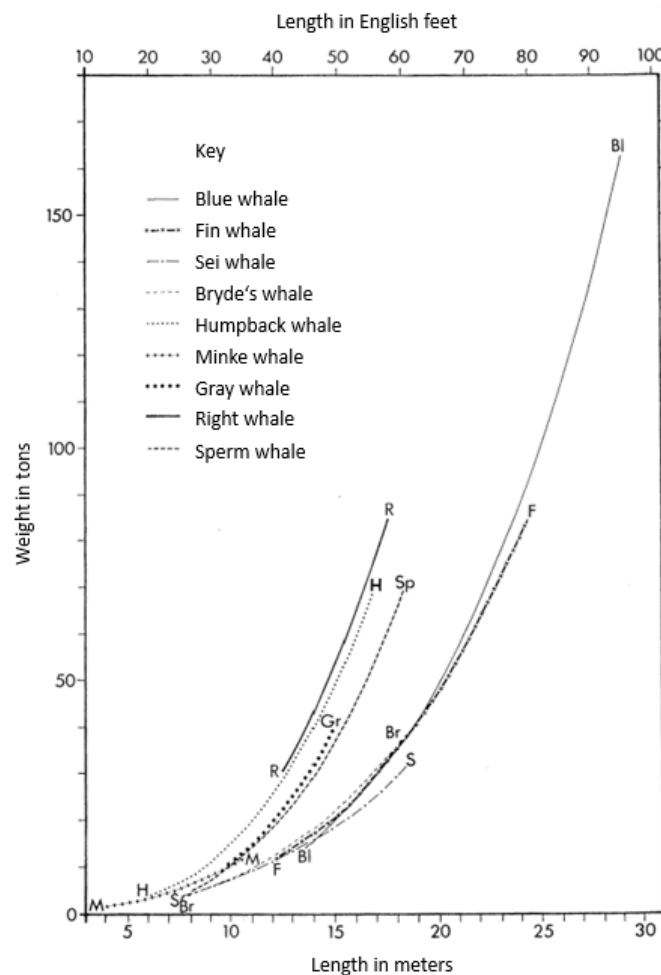
Although efforts have been made to develop new and more effective whaling methods over the years, a method of killing whales more effective than harpoon grenades has yet to be adopted.

In parallel with the development of better harpoon grenades, there has been an assessment of which angle of shot yields better results, and then which target areas on the whale are believed to yield the quickest death.

2.4 An international comparison of the time to death in the hunting of large whales

Although not much research has been conducted regarding the TTD of large whales during whaling, an expert group organized by NAMMCO has specifically examined and compared whaling methods. In the context of this comparison, it is worth bearing in mind that the length and weight of large whales varies by species, as seen in Image 3.

Image 3 - The length and weight of whales by species



Source: Lockyer (1976).

According to NAMMCO recommendations for the assessment of TTD, in addition to time measurements, data should be collected and analyzed with regard to the animal's size, the harpoon's shooting distance and angle of shot, the area of impact and the blast area (NAMMCO 2015a). In addition to reports made regarding TTD during fin whale hunts off the coast of Iceland in 2014 and 2022, the findings of NAMMCO

experts were presented at a meeting in Copenhagen in 2015 regarding the TTD during whaling off the coast of Greenland during the period of 2007-2014 (NAMMCO 2015b), as well as TTD during whaling conducted off the coast of Japan during the period of 2009-2014 (NAMMCO 2015c). It should be noted, however, that whaling in Greenland is classified as indigenous whaling and is consequently quite different from commercial whaling. When data for the hunting of large whales was summarized, the conclusions regarding time to death (TTD) vary, as seen in Tables 1 and 2, and the same applies to the instantaneous death rate (IDR) for whales.³

Table 1 - Comparison of TTD in the hunting of large whales in Greenland

Type	Year/period	Whaling method	Average TTD minutes			IDR %	Sample size
			AVG	Median	Standard deviation		
Fin whale	2007	Harpoon grenade, 30 g of penthrite as primary explosive and as a reserve	15	13		30%	10
	2008		11	10		20%	10
	2009		23	25		14%	7
	2010		22	4		33%	3
	2011		21	15		20%	5
	2012		8	8		25%	4
	2013	12	10		44%	9	
Humpback whale	2014	22	10		36%	11	
	2010	Harpoon grenade, 30 g of penthrite as primary explosive and as a reserve	23	7		17%	6
	2011		9	3		50%	6
	2012	Harpoon grenade, 45 g of penthrite as primary explosive and as a reserve	12	13		25%	8
	2013		30	15		17%	6
2014		21	10		17%	6	

Source: Prepared from the NAMMCO (2015b) report.

Table 2 Comparison of TTD in the hunting of large whales in Japan

Type	Year/period	Whaling method	Average TTD minutes:seconds			IDR %	Sample size
			AVG	Median	Standard deviation		
Fin whale	2009/10	75 mm harpoon with 60 g/50 g of penthrite, spare harpoon with 60 g of penthrite		0:00		100%	1
	2010/11		11:40	11:40	16:30	50%	2
	2012/13			0:00		100%	1
Sei whale	2010	75 mm harpoon with 60 g/50 g of penthrite, spare harpoon with 60 g/50 g of penthrite, non-explosive harpoon, or large rifle (.458)	0:00	3:05	4:00	52.0%	100
	2011		3:00	3:58	4:22	52.0%	95
	2012		0:00	3:31	7:56	41.1%	100
	2013		0:00	2:30	3:40	52.0%	100
	2014		2:05	3:26	4:40	60.0%	90
	2015		0:00	3:01	3:56	46.7%	90
Bryde's whale	2010	75 mm harpoon with 50 g/30 g of penthrite, spare harpoon with 60 g/50 g of penthrite, non-explosive harpoon, or large rifle (.375/.458)	0:00	2:31	4:21	53.3%	50
	2011		0:50	1:53	2:16	58.0%	50
	2012		0:00	1:21	2:20	50.0%	34
	2013		2:50	4:31	8:14	70.6%	28
	2014		0:00	2:43	4:09	46.4%	25
	2015		0:00	2:54	3:24	60.0%	25
Sperm whale	2010	75 mm harpoon with 60 g/50 g of penthrite, spare harpoon with 60 g/50 g of penthrite	0:00	0:00	0:00	52.0%	3
	2011		6:30			0,0	1
	2012		3:07	4:10	2:44	33.3%	3
	2013		11:00			0,0	1

Source: Prepared from the NAMMCO (2015c) report.

³ IDR or "Instantaneous Death Rate" refers to the rate of animals killed instantly.

Although the amount of explosive material used in harpoons in the above tables varies, and there is no indication of the harpoon shooting range, shooting angle, area of impact or area of the blast, the above-mentioned data serves as an indication of the situation in these countries with concern to the hunting of large whales, in comparison to the data available on fin whale hunting off the coast of Iceland.

A report on fin whale hunting during the 2014 hunting season (NAMMCO 2015d) states that the instantaneous death rate was 84% for the 50 whales assessed. Furthermore, the report states that the median time to death (TTD) of the eight whales which were shot again was eight minutes, with the shortest registered TTD being 6.5 minutes and the longest being 15 minutes. The Icelandic Food and Veterinary Authority's (2023) monitoring report on the welfare of whales in the hunting of fin whales in Iceland in 2022 specifies that 59% of the animals were killed instantly and that the median time to death was 11.5 minutes (from 1 to 120 min) for those animals that did not die instantly.

The deliberation by NAMMCO experts on Japan's hunting of large whales in a report (NAMMCO 2010) notes that although both Japan and Norway use penthrite harpoon grenades, there is a significant difference in the proportion of the animals killed immediately. The above-mentioned study states that possible causes for the variance in TTD for whaling in Japan and Norway have to do with whether the whales are shot from the side or from behind. It is clear that the angle of shot is a possible factor of influence when it comes to variance in TTD and IDR. However, when comparing the conclusions with regard to TTD and IDR from different countries and time periods, one must consider that it is not clear whether comparable methods of measurement were used in all cases.

2.5 General considerations concerning methods of hunting large whales

Iceland is party to the International Convention for the Regulation of Whaling from December 2nd, 1946 (IWC 1946), and rejoined the International Whaling Commission (IWC) in 2002. On the basis of international obligations, while taking into account Iceland's reservations, Iceland is therefore obliged to adhere to the restrictions set out in the annexes to the Convention governing the hunting of fin whales. Article 15 (b) of the Annex to the Convention (IWC 2018) includes further information regarding the size restrictions for fin whales that may be hunted. These restrictions have been introduced into Icelandic law and are also reflected in Article 3 (b) of Law no. 26/1949, on whaling, as well as Article 2 of Regulation no. 163/1973, on whaling. Furthermore, Appendix A to the Convention specifies what information should be recorded in the log book of catch statistics during whaling. This information then needs to be submitted to the IWC. The attached form in the Annex specifies the whaling methods that are mentioned, i.e. the type of harpoon that was used during the hunt: explosive/electric/non-explosive (IWC 2018). At the 32nd annual meeting of the IWC in 1981, a binding resolution was adopted which prohibited the use of non-explosive harpoons in commercial whaling (IWC 1981).

In the letter of permit to Hvalur hf. (Ministry of Industries and Innovation, 2019) regarding the hunting of fin whales for the period of 2019-2023, issued on July 5th, 2019, Article 4, Paragraph 2, specifies that explosive projectiles of the type Hvalgranat-99 or other killing equipment considered by the Directorate of Fisheries to be of the same or superior function should be used during whaling. Accordingly, the Directorate of Fisheries must assess whether it would be permissible to use other types of killing equipment, assuming that the functionality is the same or superior to Hvalgranat-99, and provided that the equipment is in accordance with international commitments. In this way, it is possible that another form of killing equipment could be permitted, provided that its use complies with the previously stated requirements.

Such an assessment would therefore also need to take into consideration matters of dispute with regard to animal welfare and the requirements set out in Paragraph 1 of the letter of permit.

2.6 Whaling Guns and Harpoon Grenades

When hunting large whales off the coast of Iceland, a 90 mm Kongsberg whaling gun is used, comparable to the one seen in Image 4, but 50 mm whaling guns are used for the hunting of minke whales off the coast of Norway. As previously noted, the use of Hvalgranat-99 for the hunting of fin whales is mandatory. Initially, the equipment was designed for the hunting of minke whales, but has since been adapted to the hunting of fin whales, particularly by increasing the amount of explosive material, strengthening the core of the grenade, and adjusting the size of the harpoon.

Image 4 - 90 mm Kongsberg whaling gun with a loaded harpoon



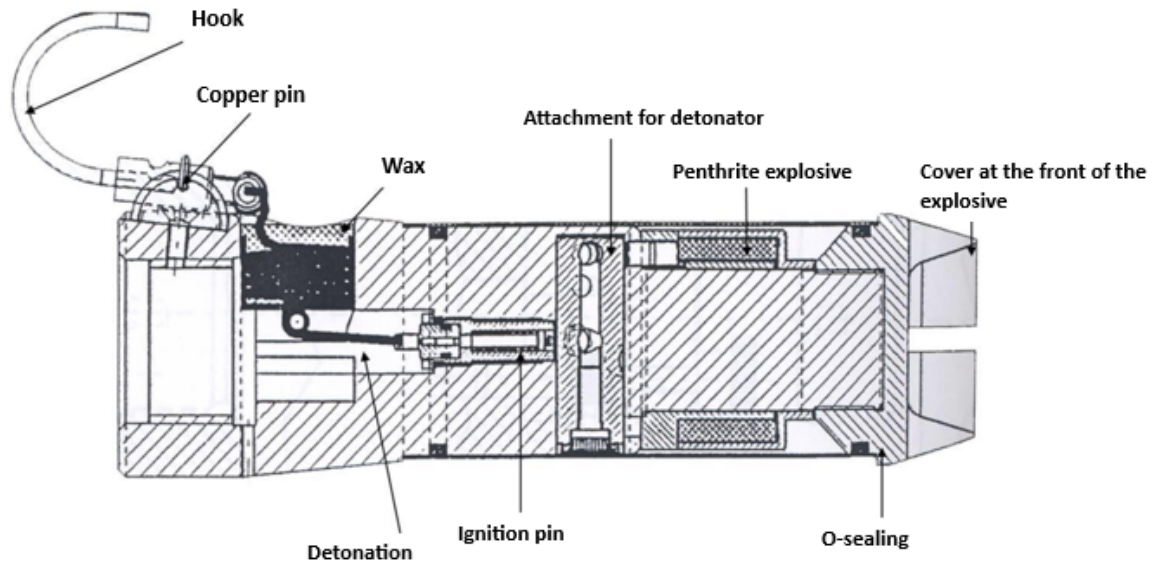
Source: A photo taken by Egil Ole, from the NAMMCO guidelines (2015e).

An important part of the work within NAMMCO has included coverage of whaling methods and issuing detailed guidelines (NAMMCO 2015e) on the use of harpoon grenades and their handling in hunting smaller and larger whales. It provides guidelines for the use of whaling equipment used to hunt fin whales off the coast of Iceland.

Image 5 shows a cross-section of the Hvalgranat-99 and how the explosive projectile is constructed. During the hunting of fin whales, the explosive projectile, containing 100 g of compacted penthrite⁴, is then screwed onto the harpoon. The grenade is built around a steel core and the exterior is encased in aluminum. The trigger line, which is approx. 90 centimeters in length, is designed so that it should detonate after penetrating 110-120 centimeters into the whale, once a force of 50-70 kg is exerted on the trigger line.

⁴ Pentaerythritol tetranitrate (PETN) – C₅H₈N₄O₁₂

Image 5 - A cross-section of Hvalgranat-99



Source: Image obtained from NAMMCO (2015e) guidelines and localized.

With some simplification, it could be said that the harpoon grenade works by sticking the hook (Image 6) in the animal’s blubber, which then pulls on a trigger line (see white line proceeding from the hook and down along the harpoon in Image 6) which then activates the explosive material and detonates the grenade. During the hunting of fin whales, a section of the trigger line is kept outside the grenade itself, as seen in Image 6.

Image 6 - A harpoon and a Hvalgranat-99 grenade with a hook



Source: Image obtained from NAMMCO (2015e) guidelines.

The report issued by the Icelandic Food and Veterinary Authority (2023) concerning the 2022 season noted some issues that could affect deviations in the use of the above-mentioned equipment. The Task Force therefore examined a number of issues relating to the type and function of the harpoon gun, with regard to animal welfare, and discussed what might lead to those deviations, when a shot fails to kill the whale.

The Task Force received a more detailed presentation of the harpoon grenade's function from dr. Egil Ole Øen, who was party to the design and construction of the harpoon grenades, as well as receiving answers to certain questions submitted to representatives of Hvalur hf. on a field trip to visit the whaling vessels. The Task Force further enjoyed the assistance of an explosives expert from the Coast Guard to assess the strength and impact of the grenade, and to evaluate suggested proposals and possible remedial action. Thus, efforts were made to assess what the reasons for deviation might be, while taking into account both the efficacy of the equipment as well as the target area when hunting for fin whales.

2.7 Target area and angle of shot

NAMMCO (2015e) has defined, in the above-mentioned guidelines, the area which should be targeted when using harpoon grenades, as indicated by the grayed-out area in Image 7. By targeting this area, the harpoon grenade is designed to cause a swift death. During its examination, the Task Force explored the function of harpoon grenades and discussed how they are intended to kill the animal. Discussions revealed that, when the penthrite detonates within the animal, a shock wave is formed, which is intended to cause harm to vital tissue and organs. While it is not always possible to confirm observable damage, the shock wave appears to be able to cause damage to the brain and central nervous system, which results in loss of consciousness and rapid death. It is a matter of dispute, however, why the blast and its effect is not the same in each case, and it is not always clear why deviations arise, where animals are not killed instantly.

Image 7 - Target area in fin whale hunting



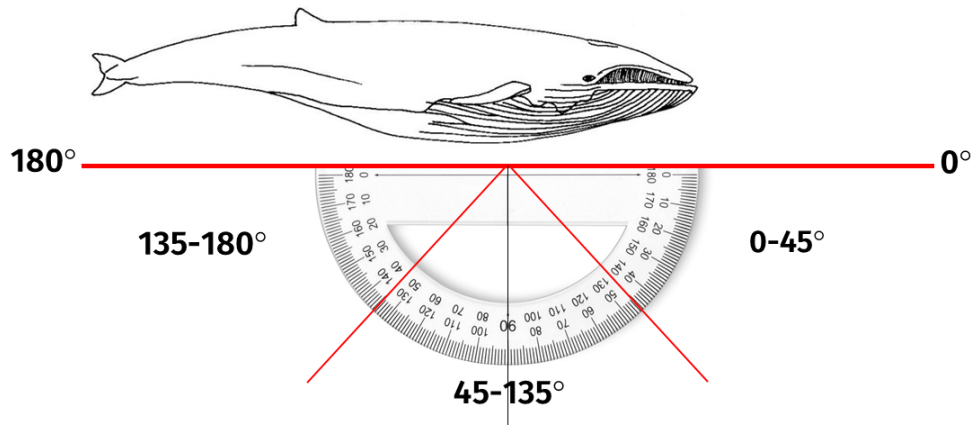
Source: Image obtained from NAMMCO (2015e) guidelines.

The aforementioned area as concerns whaling is selected based on the fact that the chest cavity houses the animal's heart and lungs, which in turn are connected to major blood vessels. Above the chest cavity lies the back area, where the spinal cord is located, extending to the animal's brain. The organs located in this area are vital. Damage to this area, caused by an explosion, should therefore cause the animal to be killed rapidly if the shot is directly lateral to the animal, as advised. With regard to the diameter of fin whales, the Task Force debated whether the depth of explosions at a penetrating depth of 110-120 centimeters is sufficient to cause the necessary damage and ensure the rapid death of the animal.

The Task Force also discussed deviations, in cases where shots hit the target area and the grenade detonated, but there was no visible, significant damage to vital organs, or in cases when the animal wasn't killed as quickly as would be considered optimal. Furthermore, the Task Force dealt with other deviations, such as cases where the harpoon failed to detonate, and possible causes of that, such as the harpoon failing to penetrate the animal deeply enough.

According to the NAMMCO (2015f) proposals, the recommended angle of shot during whaling is a horizontal angle of 45-135° along the longitudinal axis of the animal. Generally, where the animal is shot from the front, the angle of the shot should be 0°, whereas if it is shot from behind, the angle of shot should be 180°, etc. as seen in Image 8.

Image 8 - Recommended angle of shot



Source: The Icelandic Food and Veterinary Authority's summary report.

2.8 Time until refiring

Since it has not been possible to ensure that all animals die quickly with a single shot, even if the shot strikes the target area of the animal, or in cases where shots miss the target, the reloading time for the shooter may be an important factor. It is a matter of dispute whether the time it takes to prepare for refiring restricts the crew's ability to ensure animal welfare during fin whale hunts. As it is not possible, based on the design of the vessels currently being used to hunt fin whales, to add an additional harpoon gun to be used as backup, the time required to prepare for refiring may be impactful. Based on measurements made by employees of Hvalur hf. on July 26th, 2023, the minimum time required to load a gun, replace the firing line and set up the harpoon grenade is two minutes and eight seconds. It is, however, a matter of dispute whether that variable is a deciding factor in cases that require refiring, where other conditions may lead to it being impossible to refire at the whale immediately upon finishing preparations for refiring, such as ensuring that the whale is within shooting range. Should the first shot be unsuccessful and fail to immediately kill the animal, it is common for the animal to respond by diving for several minutes, and the animal may then be out of shooting range by the time it emerges. The shooting range may therefore be subject to the orientation of the animal and its distance from the vessel, and whether the crew can find aim at the target area immediately upon completing preparations for refiring.

3. Assessment of ways to reduce the rate of deviations

3.1 Framing of disputed issues

The role of the Task Force is to assess whether fin whale hunts could be improved, so as to reduce the number of deviations in whaling, of the kind revealed by the results of monitoring efforts in 2022.

Hunting large whales is inherently problematic, and there are many factors that may affect the success of the hunt. Unlike marine fishing, whaling is inherently a hunting activity which utilizes shooting equipment and explosive ammunition. Unlike most other forms of hunting, whaling takes place at sea and not on land, with animals being shot from vessels at a distance during the short intervals where the animals partially surface for air. When hunting large whales such as fin whales, which are the second-largest animals on Earth and the largest animals currently being hunted, the size of the animals is an additional factor, which creates separate issues with regard to ensuring a rapid and relatively painless death for the animal.

The above-mentioned issues can be divided into four categories:

1. Whaling equipment. This category includes the design and function of equipment used in whaling.
2. Whaling methods. This category includes procedures for the application of whaling equipment, including shooting range, angle of shot, refiring, etc.
3. Shooters and crew. This category includes factors pertaining to the knowledge, training and experience of the crew taking part in the hunt, their decision-making skills, and how they apply themselves to the hunt.
4. External conditions. This category includes visibility, wind speed, wave height, etc.

Each option will now be outlined, along with the Task Force's assessment of whether the option in question is expected to have an effect on deviations during the hunting of large whales. The proposals submitted by Hvalur, and the individual items specifically examined by the Task Force are outlined. This concludes with a deliberation on the Task Force's assessment of the cumulative effect of the proposals. The proposals are not arranged in any particular order based on their priority or impact.

3.2 Implementing a new type of sight

Last hunting season, Hvalur hf. used an older model of sights, but plans are underway to adopt a new model and test it under conditions in the field during the 2023 season. Hvalur hf. has tested a new technique that assists a shooter in detecting the sight on the animal by using an illuminated point which automatically adjusts even if the shooter's eye is not correctly aligned with the gun. The new sight is therefore intended to make it easier for shooters to hit the recommended target area on the animal and, thereby, increase the likelihood of the animal being killed swiftly after being shot.

Hvalur's description of the proposal

A change was made to the sights aboard whaling vessels and a new type of sight with an illuminated dot implemented. The new sights have a built-in correction, so that the point of the sight is always correct, even if the shooter's eye isn't exactly aligned with the gun. This way, variability between individuals is eliminated and the effect of the ship's movements on targeting is minimized. If the shooter is able to see the illuminated point, then the sight is correctly positioned, regardless of whether the shooter is slightly to the side of, above, or below the correct line of fire. Both whaling vessels have been involved in a shooting drill in Hvalfjörður, where the guns were "fired in", and have therefore been calibrated correctly.

As noted in section 2.2 above, hunting at sea is not entirely comparable to conventional hunting, as it involves conditions that can't be controlled for, and this creates unique challenges. This is especially true for targeting where waves, weather and winds, the movement of the vessel, the behavior of the animal in the sea, and the short time it appears above water, can affect the shooter's ability to target the animal accurately and correctly. Although this involves large animals, an emphasis has been placed on hitting the animal in a specific and relatively small area, in order to increase the likelihood of the animal being killed quickly.

3.2.1 Effects of a new type of illuminated dot sight

The Task Force has assessed whether the use of a new type of illuminated dot sight is likely to improve hunting performance, with regard to improved animal welfare, and have an effect on reducing the number of deviations during the hunting of fin whales, compared to the older type of sights. A shot fired at the targeted area is not only affected by the sight being used, but by range, the flight of the harpoon, and the equipment's functionality. Nevertheless, good aim is a prerequisite for a shot to hit the target area.

Conclusions of the assessment

The Task Force has concluded that the impact of this change must be examined in parallel with other factors that may affect the harpoon's ability to hit the recommended target area. Therefore, improved sights can have a positive effect on the execution of whaling efforts. The Task Force has concluded that the new sights are conducive to affecting deviations during the hunting of fin whales.

3.3 Attaching the firing line to the harpoon

Hvalur has reported that changes were made to the method used to attach a new line to the harpoon firing line in the summer of 2022.

Hvalur's description of the proposal

In the summer of 2022, a new method of attaching a firing line to a harpoon was put into use. The [previous] method involved attaching a loop made out of coiled, 2.5mm steel wires to a hole in the harpoon and then splicing the firing line to the steel loop. This process took several minutes. A modification was made [where] a lock made of a supertow replaces the steel loops and the [new] loop comes already spliced and ready to use. This means that it is not necessary to splice the firing line to steel loops each time, thereby saving a few minutes during the preparation for each shot, which is an important factor when reshooting. Now this process only takes a few seconds. Experience with this

Additional information from Hvalur, dated August 18th, 2023, revealed the effects of attaching the firing line to the harpoon:

“In memo P23-10-M01, it was noted that harpoon coupling reduced the time by several minutes, as the firing line no longer needed to be spliced to the harpoon. This is certainly correct, but does not affect whaling efforts because the splicing is done prior to the start of the hunt. Therefore, this improvement does not affect whaling efforts.”

3.3.1 Effect of attaching the firing line to the harpoon

The Task Force has discussed whether the modified coupling of the firing line to the harpoon will have an impact on the hunt. The Task Force has concluded that, although the changes to the coupling may save time and increase efficiency, the splicing has already been completed prior to the commencement of the hunt.

Conclusions of the assessment

The Task force has concluded that this change does not lead to a reduction in the rate of deviations in comparison to older equipment.

3.4 A new firing line

Hvalur's correspondance states that new firing lines have been put into operation.⁵ The line is attached to the harpoon which is fired into the animal. The primary objective of the new firing line is to ensure the correct trajectory of the harpoon. The new and lighter design of the firing line is supposed to lead to a more direct trajectory and flight of the harpoon, thereby increasing the likelihood of the harpoon hitting the recommended target area on the animal from the right angle. This should increase the odds of the explosive projectile detonating in the right area on the animal. According to data from Hvalur, the velocity of a harpoon with the new line is increased from 90 m/s to 100 m/s.

⁵ The “firing line” refers to the line which is being fired into the whale and is used to draw the whale to the vessel.

Hvalur's description of the proposal

The same type of firing line has been in use over the past decades. The tow-rope part of the firing line was produced by a British company which was later acquired by another British company. Although the companies are no longer selling the tow-rope, the tow-rope has been produced especially for Hvalur hf. through the years.

In the middle of the season of 2022, crews noticed that some changes had been made to the tow-rope used in the firing line, but no change had been reported from the suppliers. However, upon inspecting the tow-rope, it became clear that the design had been modified [without] the knowledge of Hvalur hf. and that this had negatively affected the harpoon's flight. After contacting the manufacturer, it was confirmed that a change had certainly been made and that the raw material which had previously been used was no longer available. After learning this, a sample was sent for analysis at Hampiðjan's laboratory in Lithuania, where the tensile strength of the tow-rope was evaluated, among other things. Consequently the author selected a new firing line with a different composition than before, to be used in whaling. Tests were carried out in Hvalfjörður, where the trajectory of the harpoon was tested and compared to the flight of the harpoon using the previous firing line. Those test revealed that the new firing line offered improved drag behind the harpoon, therefore that firing line has been in continued use. Furthermore, tests revealed that the location of a firing line in a box at the front of the gun deck was suboptimal, as the angle between the gun and the line varied, depending on the direction in which the gun was facing. [...]

The new firing line is "torque neutral", as it is interlaced instead of being coiled like previous firing lines. Lines that are coiled form torque under stress, and as the harpoon is unrestricted in the air, the firing line strives to rotate the harpoon. An interlaced firing line, however, does not do that as no torque is created when the line is under stress. When these positive effects were revealed, an effort was made to explore if the firing line could be made more rigid, as a more rigid line would reduce the vibration of the line and thereby minimize its impact on the harpoon. A new type of firing line (with a material that conducts electricity at its core) with a higher torsional rigidity was tested onboard Hvalur 8 and Hvalur 9, along with a new type of basket, and this has improved the harpoon's flight significantly.

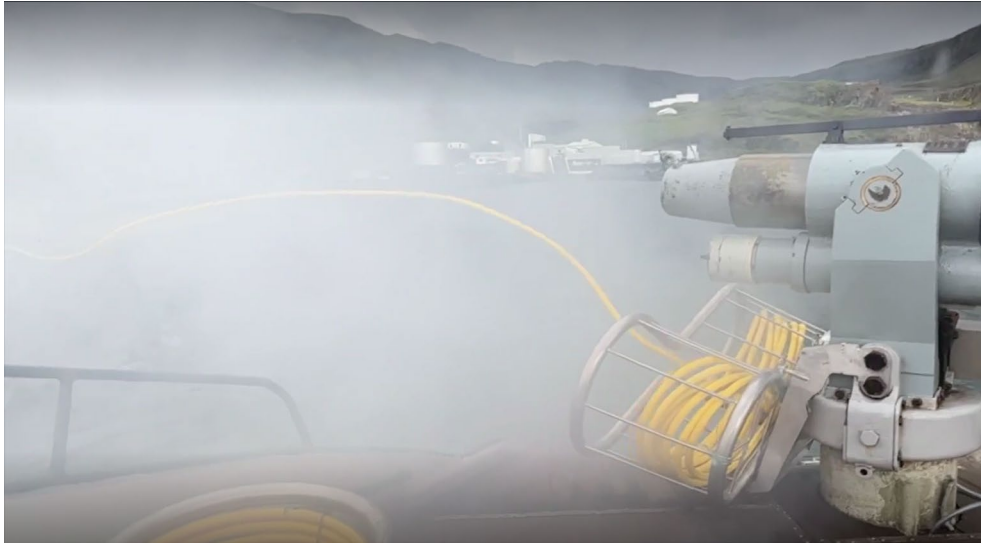
Image 9 - An older type of firing line (coiled)



Source: Screenshot taken from Hvalur's video recording.

In Image 9 above, an older type of decommissioned coiled firing line is pictured. A new type of interlaced firing line, as seen in Image 10, has been tested and is ready for use.

Image 10 - A new type of firing line (interlaced)



Source: Screenshot taken from Hvalur's video recording.

It should be noted that since the aforementioned firing line has not yet been used in whaling, experience has not been established, although Hvalur's tests in comparison with the functionality of the older firing line have indicated improved functionality.

3.4.1 Impact of firing line design

It has been revealed that the new type of firing line is both lighter and more rigid. Using a new firing line could increase the probability that the trajectory of the harpoon is correctly orientated relative to the directional axis. Increased rigidity of the firing line is considered likely to increase the stability of the harpoon, and could thereby reduce the impact caused by the unstable flight of the harpoon. The weight of a firing line may affect the flight and trajectory of the harpoon as a heavier firing line can affect both the stability and velocity of the harpoon.

It is worth mentioning that the older type of firing line absorbed water, which made it heavier. The new type of firing line has the property of not absorbing liquid in the same way, as well as being lighter. The new line could thereby reduce the impact of the line on the harpoon's trajectory, and thereby increase the likelihood of the harpoon maintaining the correct trajectory after being fired.

From the above, it can be deduced that the number of unknown variables could be reduced and that a harpoon grenade would be more likely to hit an animal from the right angle and detonate at the desired area on the animal.

The Task Force has evaluated whether these factors may be conducive to improving the execution of whaling efforts. That assessment is primarily based on the characteristics that Hvalur believes the new line has, but there may be reason to verify the effects of said improvements through further testing and measuring.

Conclusions of the assessment

The Task Force has concluded that the factors which the new line is intended to remedy are suited to improving the execution of whaling efforts and influencing deviations in the hunting of fin whales.

3.5 Firing line basket

According to information obtained from Hvalur, a new basket has been designed to hold the line which is attached to the harpoon gun.

Hvalur's description of the proposal

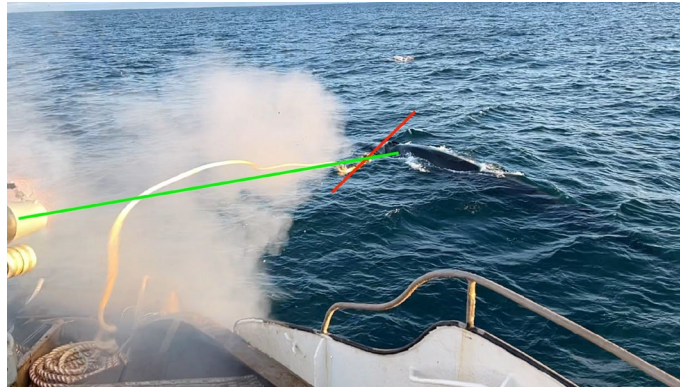
Up until the 2023 hunting season, the firing line has been coiled down in a box at the front of the gun deck. The crew of whaling vessels have had to advance to the prow and coil up the firing line after each whale that was caught, to prepare for the next hunt. Usually it has not been a problem if it takes a few minutes to prepare the line, as there are always two lines that have been prepared.

Since the line lies in a box in front of the gun, the angle between the line and the gun is [always] changing with each movement of the gun, both when the gun is turned on a horizontal axis as well as on a vertical axis. This variation affects how the line pulls on the harpoon, which affects the aim and where the harpoon lands on the prey.

In the summer of 2022, it was discovered that a so-called "chain fountain" is formed when the firing line spools from a box. This "chain fountain" elevates the line high into the air, which in turn has a significant effect on the flight of the harpoon. The reason for this, is that the line must first be pulled up (vertically) and then pulled out following the harpoon. To avoid this and exclude the variation in angles between the line and the harpoon, a new basket was designed for the firing line. The new basket is shaped like a ∞ , so that when the firing line is laid down, it creates half a rotation of the tow-rope for half of each each layer in the basket and half a rotation in the opposite direction. This method ensures that the net rotation of the firing line is 0. The basket is tilted forward so the line can exit the basket more easily and follow the harpoon, and during testing in Hvalfjörður it was found that the new firing line, with the new basket, follows the harpoon very well and many variables have been eliminated, as the angles are always the same as the kinetic energy of the line, with a minimal vertical trajectory. Therefore, it can be stated that the variance between shots has been reduced.

It does not take long to replace the basket and prepare for the next shot, as such the time it takes to prepare the next shot is reduced and thereby the time required for reshooting, should the first shot fail to kill the animal.

Image 11 shows a harpoon gun with an older type of firing line basket. As can be seen from the image, the line flew up from the basket horizontally before a line was pulled vertically behind the harpoon. This caused the line to be drawn up into an arc, that could interfere with the harpoon's flight and how it landed on the animal. The green line shows the orientation of the harpoon gun, but the red line shows the trajectory of the harpoon when it hits the animal.

Image 11 - An older type of firing line basket (line does not follow the orientation of the harpoon gun)

Source: Image obtained from the notes submitted by Hvalur.

Image 12 is of a newer type of firing line basket, showing how the harpoon pulls a line directly from the firing line basket. The aim of this is to assist in retaining the orientation of the firing line, and thereby reducing variation in terms of the harpoon's trajectory.

Image 12 - A new type of firing line basket (line follows the direction of the harpoon gun)

Source: Screenshot taken from Hvalur's video recording.

A new firing line basket is also supposed to reduce the time required for preparing for refiring, as a line has already been prepared in the firing line basket, as can be seen here on the right in Image 13. Thereby, it is possible to replace the firing line basket in less time.

Image 13 - A firing line basket being replaced

Source: Screenshot taken from Hvalur's video recording.

3.5.1 Impact of a firing line basket

The Task Force has concluded that the new firing line basket may lead to three types of effects, each of which may lead to a reduction in the rate of deviations in fin whale hunting. Firstly, by moving with the harpoon gun instead of remaining behind, regardless of the movement of the gun, as was the case with the older type of basket. Secondly, by preventing a negative impact on the harpoon's flight when the line is drawn from the basket. Thirdly, by reducing the time required to prepare for refiring.

Conclusions of the assessment

The Task Force has considered whether the use of a new firing line basket is likely to improve the execution of whaling efforts. The Task Force has concluded that the intended effect of utilizing a new firing line basket is conducive to reducing the rate of deviations in fin whale hunting.

3.6 Velocity and directional axis of the harpoon

The Task Force examined the impact of a shooting line basket and a new firing line on the harpoon's stability and trajectory. The Task Force has concluded that the line and firing line baskets can adversely affect the harpoon's flight. It was therefore suggested that remedial measures directed at those factors which are capable of disrupting the process were conducive to improving the execution of whaling efforts, by increasing the likelihood of the harpoon hitting the whales from the correct trajectory. Image 14 and Image 16 reveal, on one hand, a harpoon that has rotated and has ended up above the directional axis and, on the other, a harpoon with the correct directional axis.

Image 14 - A harpoon that has rotated and landed above the directional axis

Source: An image from Hvalur's memo, including further information on remedial measures.

In their comments regarding the impact before and after changing the line and firing line basket, Hvalur states that the older line significantly affected the trajectory of the harpoon, as indicated in the description of the flight trajectory and the most significant influencing factors. This is outlined in the following steps:

Hvalur's description of how the harpoon is negatively impacted by an older type of line

1. A shot is fired.
2. The harpoon leaves the gun in the correct trajectory towards a target. Image 11 shows how the harpoon's trajectory is right on target.
3. The harpoon drags out the line and has to lift it up before pulling it forward. This is the start of a "chain fountain". As the line is located below the harpoon, force is generated when the line is pulled out and that force is not in the same direction as the harpoon, pulling its tail down, leading to the harpoon rotating around its center of mass, as can be seen in Image 11, showing a harpoon that has revolved around the directional axis with the tail below the directional axis.
4. Once the harpoon has rotated around the center of mass, the wind resistance changes and more pressure is enacted on the shaft where it has rotated due to the line. This increased resistance creates torque, which acts by creating reverse rotation on the harpoon.
5. As the line has been extracted, the force acting on the harpoon is decreased, while simultaneously gaining angular velocity due to changes in wind resistance.
6. The harpoon rotates in reverse, so that its tail ends above the directional axis. Again, wind resistance acts on the shaft, but now in the opposite direction. As can be seen in Image 14, the harpoon has rotated and its tail is now above the directional axis.

Image 15 - Harpoon exiting the barrel, with an older type of line



Source: An image from Hvalur's memo, including further information on remedial measures.

Image 16 - A harpoon with the correct directional axis



Source: An image from Hvalur's memo, including further information on remedial measures.

Conclusions of the assessment

The Task Force has concluded that the impact of an improved firing line and firing line basket on the velocity and directional axis of a harpoon is expected to be conducive to improving the execution of whaling efforts.

3.7 Evaluation of range

A new type of method has been submitted, to measure the distance of the animal from the vessel. A more accurate technique to gauge range is intended to increase the likelihood of an animal being shot at the recommended range.

Hvalur's description of the proposal

Artificial intelligence and camera technology which shows the distances between the gun and the prey have been developed. This technique corrects all calculations according to the vessel's position at any given time, and is therefore correct regardless of the ship's inclination on the wave. Crew members, aside from the shooter, can determine distance to the prey and inform the shooter via radio equipment installed in the crew's helmets. The shooter is not intended to be able to establish the range on a display, as the shooter needs to be focused on the prey. This way, variation between individuals [with regard to distances] is eliminated and it is ensured that the chosen range is always within the established maximum range. Hvalur hf. has defined the maximum range as 35 meters, based on the company's whaling experience. It should be noted that that maximum range could [change] with more detailed information on the actual range at any given time, but this information relies on individual estimation, and there is a significant variance in how individuals perceive range, particularly at sea, without reference points.

Additionally, it should be noted that the measured length of a loose firing line in a basket is 45 m, resulting in a maximum range of 40 m.

3.7.1 Impact of range estimations

The Task Force deliberated on the impact of range when shooting whales. According to the information provided by Hvalur, it has been suggested that the furthest range of shooting is 35 m and that this range is based on the company's experience. In the NAMMCO (2015a) report prepared following the 2014 hunting season, it is stated that the range of shooting affected the animal's TTD, although it was also noted that the population being observed was small.

A visual estimate of range is inherently imprecise, as individuals will perceive distance in different ways. In addition, hunting at sea provides no reference points to evaluate distances. Even with experience, this makes it almost impossible to accurately estimate the range. Artificial intelligence and camera technology are intended to address this.

An accurately assessed distance is the basis for accurately factoring in other variables that affect the harpoon's trajectory, such as wind and humidity. As the shooter needs to adjust the aim with respect to, among other things, the aforementioned variants, and where they work in tandem, one must consider that utilizing a technique that promotes an improved assessment of range, is conducive to an increased likelihood of the shot being successful, thereby contributing to a reduction in the number of deviations during the hunting of fin whales.

More accurate data on the range of shooting and the logging of those statistics will further contribute over time to an improved understanding of the optimal range of shooting, which includes factoring in the harpoon's flight.

Conclusions of the assessment

The Task Force has concluded that the effects meant to be achieved with a range sight may be conducive to improving shooting performance.

3.8 Gun powder blend

According to data from Hvalur, changes have been made to the process and blending of gun powder used to propel the projectile. These changes are intended to eliminate variability.

Hvalur hf.'s description of the proposal

During 2022 shooting tests, a variation in the velocity of the harpoon and in the color of the smoke between shots was revealed. The process of blending gun powder was reviewed, but the powder consists of a blend of two different [types of powder]. One of the powders is fast-burning and ensures the ignition of the main powder, which burns more slowly.

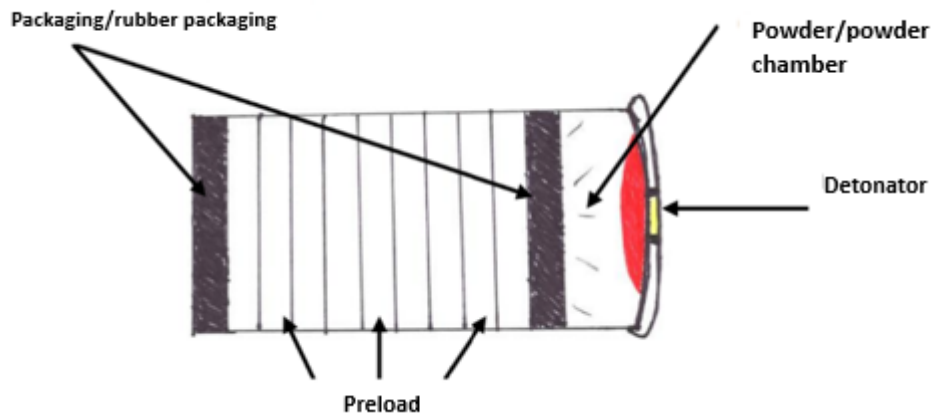
It was revealed that variation could occur in the powder blend and that, since the particle size and shape in the powder varied, the powder blend could separate after mixing. There is a particular risk of this separation happening in the case of vibrations, as is the case onboard whaling vessels. For each shot, the crew tried to move the powder bags as little as possible prior to each shot, in order not to affect the powder blend, but this has now been changed so that the crew is able to move the powder and blends it again before firing. During shooting tests, following the change, no smoke variation has been noted, and the speed of the harpoon is more uniform.

Images 17 and 18 show how the 90 mm Kongsberg whaling gun is loaded, the powder bag, and the composition of the charge in the cartridge.

Image 17 - 90 mm Kongsberg gun loaded (left) and powder bag (right)



Source: NAMMCO (2015e).

Image 18 - Charge in cartridge

Source: NAMMCO (2015e) with localized text.

3.8.1 Impact of gun powder blend

The Task Force has evaluated whether improvements to the powder blend would be likely to improve the execution of whaling efforts, in light of improved animal welfare. The Task Force has concluded that it is necessary to consider the blending of gunpowder a normal part of operating a whaling gun.

Conclusions of the assessment

The Task Force has concluded that, as these are normal working procedures in the preparation of shooting, this is not likely to improve the execution of whaling efforts, thereby unlikely to lead to a reduction in the rate of deviations in fin whale hunting.

3.9 Changes to projectile orientation

Hvalur has changed the location of the explosive projectile hook on a harpoon. Is this intended to reduce the number of cases where the harpoon fails to detonate.

Hvalur's description of the proposal

Given that there are cases where the explosive projectile did not detonate, the orientation of projectiles has been altered. A hook connected to an explosive projectile is attached to a line which is extended between projectiles and therefore the orientation of the projectiles will affect the positioning of the hook. The orientation of projectiles has been altered to 45° so that the new orientation of the explosive projectile hook is at the top of a harpoon (12 o'clock) instead of the previous position of 45° (10:30 p.m.). It is hoped that this change will reduce the rate of incidents where the harpoon penetrates the prey but the explosive charge fails to detonate. There is insufficient experience to determine the impact of this alteration as [whaling has not begun] for the 2023 hunting season.

3.9.1 Impact of projectile orientation

Over the years, there have been incidents where the harpoons have not detonated inside the animal. A failed detonation occurred five times in 2022, despite the harpoon hitting its mark, penetrating the animal and wounding it. The reasons for the harpoons failing to detonate have not been confirmed, as no special

examination of the harpoons was carried out in 2022. Nor is there any reason to believe that these incidents shared a common cause. Image 19 shows a harpoon with a harpoon grenade hook.

Image 19 - Harpoon with a harpoon grenade hook



Source: A photo taken by Jón Þrándur Stefánsson during the Task Force's field trip to Hvalur.

Although limited data is available, and it is likely that the causes of the deviations differ, Hvalur has indicated in their proposal, that the orientation of the projectiles has been altered and that this can affect the location of the explosive projectile hook. It is not clear whether these alterations will have an effect on whether an explosive projectile detonates.

Conclusions of the assessment

In so far as the calibration of the hook may reduce the rate of incidents where an explosive charge fails to detonate, it's possible that this can have an impact on the rate of deviations in the hunting of fin whales. The Task Force has not evaluated this change, as there is not sufficient basis for further evaluation to assess whether this will reduce the rate of deviations.

3.10 Use of electricity to kill the animal

Hvalur's proposals outline the development of a new method that uses electricity to kill the animal. This method is intended to be complementary to the traditional whaling method, which utilizes harpoon grenades. Connecting electricity to a harpoon grenade is intended to serve as a backup, in order to ensure, as far as possible, that the animal is killed with the first shot. According to the information the Task Force obtained from Hvalur, such equipment has been installed and is ready for use.

A summary report of the proposals submitted by Hvalur hf.

Hvalur's proposals explore the use of electricity for the hunting of great whales. Therein, it is stated that the company has investigated whether technological developments in the last few years would enable the company to use electricity as an additional method of killing fin whales. This study considered prior experience with the use of electricity in the Antarctic Ocean which was used to hunt approximately 2000-3000 great whales, and examined the results of that method and what prevented its continued use. The proposals state that the main limitations of the method at that time were of a technical nature, such as 1) the current generators of that time not being able to control the current and voltage, 2) the electricity transmission line giving out and 3) that one pole had been placed in the whale and sea water used as a cathode.

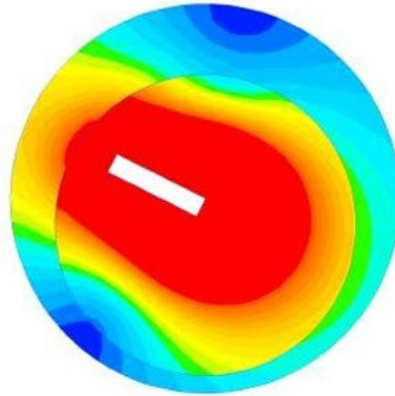
Hvalur's correspondence states that a detailed analysis of each and every obstacle had been carried out and that the company believes itself to have found solutions to those obstacles detailed in the correspondence. At Hvalur's request, these proposals will not be described further in the Task Force's report, as information presented therein may be subject to restrictions on the public's right to information.

The Task Force received further instructions on the use of electricity in whaling, both during a field trip onboard whaling vessels owned by Hvalur and in a meeting with the company's consultants. It was observed that in order to conduct the electricity to the harpoon, a copper cable had been fitted into the new line, i.e. the "supertow" mentioned in Section 3.4 above. Image 20 shows a cross-section of the supertow, with the copper cable at the center.

Image 20 - A cross-section of the supertow with copper cable

Source: A picture taken by Jón Bráundur Stefánsson of a sample cable.

In particular, the functionality of the equipment was reviewed, and discussed whether an electric current should be used to kill fin whales. Image 21 shows how an electric current is estimated to travel through the body of a fin whale based on where the electrode is located on the harpoon.

Image 21 - Conclusions of the “Finite Element Method” analysis

Source: Image obtained from Jón Atli Magnússon's presentation at Tensor ehf.

3.10.1 The Task Force review

The Task Force has concluded that, following meetings with Hvalur and on the basis of the available data, there is insufficient information available regarding the possible impact and efficacy of electricity for the killing of fin whales. The Task Force therefore does not have sufficient basis for further evaluation of the proposed use of electricity as a method of killing, whether used in continuation of or simultaneously with conventional harpoon grenades, with regard to whether it is likely to improve the execution of whaling efforts and reduce the number of deviations in fin whale hunting. In addition, the Task Force notes that, to the extent of developing new methods of killing, which have not been sufficiently tested, the provisions of Article 20 of Law no. 55/2013 may apply, cf. the deliberation in Section 4.1.

Conclusions of the assessment

The Task Force believes that various questions remain unanswered regarding the possible function and effect of electricity in the killing of whales, so that it is not possible to advocate for the use of this equipment without further examination.

3.11 Training and experience

Unlike in the case of minke whale hunting, there are no specific requirements regarding crew training and experience for the hunting of fin whales in Regulation no. 163/1973 on whaling. For instance, it is a condition for obtaining permits to hunt minke whales that at least one member of the crew has experience with hunting minke whales, i.e. has worked continuously for three months as a shooter on a whaling vessel hunting minke whales, and that shooters responsible for the hunting and killing of animals have attended a recognized course in the handling of harpoon guns, harpoon grenades, and the killing methods that are used in whaling. The shooter is also required to have a valid firearms license. No comparable provision is to be found in the regulation on crew training and experience for the hunting of fin whales.

However, Article 4 of Hvalur's hunting permit for fin whales during the period of 2019-2023 states that, during each hunt, the company must guarantee that at least three members of the crew have experience with whaling. Furthermore, it should be ensured that shooters responsible for the hunting and killing of animals have attended approved courses in the treatment of harpoon guns and harpoon grenades, as well as in the killing methods employed in whaling.

Notwithstanding the aforementioned provisions of the permit, there is no such approved course concerning the hunting of fin whales. Courses organized by NAMMCO have only been focused on the hunting of minke whales. However, Hvalur has been responsible for the training of crews and has obtained the services of Dr. Egil Ole Øen to manage that training, and he has generally visited Iceland prior to each hunting season. In his lectures, dr. Egil Ole Øen has, among other things, explored the type of explosive projectiles being used, handling and safety issues, and where to shoot the animals in order for them to be killed quickly.

It is clear that training and experience are decisive when it comes to hunting wild animals, including fin whales. Thus, it is necessary to ensure in some way that the minimum requirements regarding training and experience are being met. However, this has not been defined or explored in detail in terms of fin whale hunting. This is even more applicable when whaling is being conducted with powerful and dangerous projectiles like harpoon grenades, and under such difficult and uncontrolled conditions, as is the case when hunting large whales.

The Task Force notes different training requirements for the hunting of fin whales and minke whales. It does not seem to be the case that hunting conditions for fin whales are less demanding than for minke whales, likely more so. For comparison, it should be noted that very strict requirements are in place when hunting other wild mammals, with regard to the training and competence of hunters according to Law no. 64/1994 on the protection, preservation and hunting of wild birds and mammals, but the regulation does not apply to whaling. Thus, for example, hunters are required to pass a test on wild animals and their environment, as well as their ability to hunt after completing a course to prepare for the aptitude tests. For instance, no one is permitted to engage in reindeer hunting without first passing a practical shooting test in the previous twelve months, and then only if accompanied by an experienced guide, who also serves as a backup in case the shot misses its target.

3.11.1 Proposals of Hvalur hf.

One of Hvalur's proposals was to invest in further training and drilling of crews. These measures are intended to improve the shooting skills of hunters, in order to increase the likelihood of an animal being killed quickly in the first shot. One may also deduce from the proposal that it is possible to train the crew to reduce the time needed to prepare for refiring.

Hvalur's description of the proposal

For each season, one trip is taken to Hvalfjörður to fire at a target. The crew has been drilled in maneuvers to prepare between shots and shooters have practiced firing at a target. Already, there has been one drill on each vessel, and both crews were present at each drill to coordinate strategies and share experience. The drills continue until the shooter has gained full proficiency and is able to hit a target at a range of approximately 28 m. Hvalur hf. has decided to invest in further drilling and return with both vessels to Hvalfjörður to conduct those drills. This is part of doing everything possible to ensure that the harpoon hits the correct area on the animal.

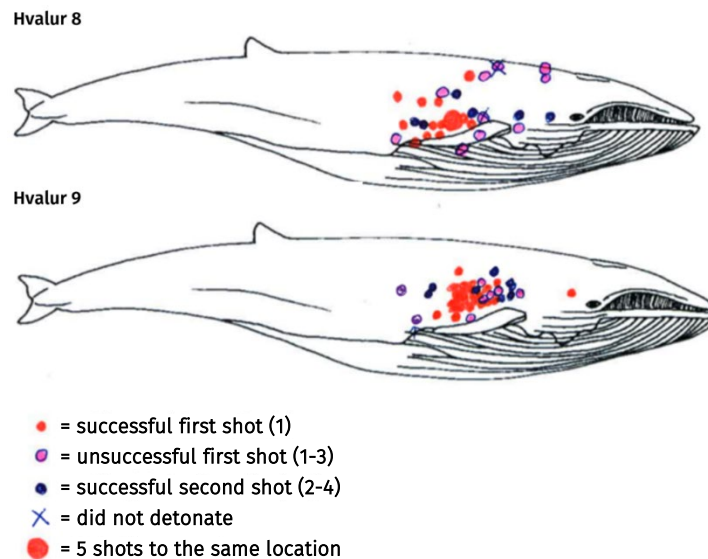
When the Task Force met with representatives of Hvalur on August 16th, 2023, it emerged that training and drills had shortened the preparation time between shots. In additional information from Hvalur, dated August 18th, 2023, information was obtained regarding crew training and results of time logging:

“The time it took the crew to fire two shots was logged. Timing was started at the first shot and stopped at the second shot. During this time, the crew has loaded the gun, changed the firing line and set up the harpoon and explosive projectile. The time logged on July 26th, 2023 reveals that the shot-to-shot time was 02:08 minutes, two minutes and eight seconds.”

3.11.2 The Task Force review

A whaling monitoring report for 2022 (The Icelandic Food and Veterinary Authority, 2023) revealed a variance in the effectiveness of shooters aboard Hvalur 8 and Hvalur 9, despite the fact that the sample size was too small to demonstrate the statistical significance of that variance. On closer inspection, one can see that the variance in the distribution of shots between the two vessels was significant, as can be seen in Image 22.

Image 22 Location of shots during the 2022 hunting season



Source: The Icelandic Food and Veterinary Authority's summary report.

The Task Force has concluded that this variance can be attributed in part to the skill, training and experience of the hunters. The aptitude and skill of a shooter is an important factor when considering the success of each hunt.

It is important that education involves practical training. For example, it is necessary to ensure that the shooter is aware of priorities and the relevant interests in different scenarios. On the first shot, it is of the utmost importance to take great care in ensuring that the animal is killed. A number of factors must be considered, such as the distance from the animal, achieving the correct angle of shot and correct aim. If, on the other hand, it is not possible to kill the animal immediately on the first shot, other factors such as velocity become more important. This, of course, does not imply that a shooter doesn't need to take great care when refiring. This is primarily to note that precision during refiring is not as paramount as with the first shot, as the most important consideration is to kill the animal rapidly.

As a matter of course, any improvements to the whaling equipment will be rendered ineffective, if the shooter does not have the required knowledge or experience to use the whaling equipment as intended, or fails to hit the correct area on the animal. The harpoon grenade's effectiveness is based on the animal being hit in the correct area and the grenade penetrating the animal correctly. In order to minimize the time required to fire another shot, in cases where animals are not killed on the first shot, it is important that both the shooter and crew act without hesitation when preparing for refiring.

Although the Task Force considers Hvalur's proposals for further training and drilling to be beneficial, the Task Force considers further actions to be necessary to induce an appreciable reduction in the number of deviations.

Conclusions of the assessment

The Task Force has concluded that increased training and education are conducive to improving the execution of whaling efforts.

3.12 Quantity of explosive material

The Task Force discussed the amount of explosive charge that should be used to propel the projectile and the amount of explosive material in whale harpoons, and whether changes to those quantities could lead to a reduction in the rate of deviations in fin whale hunting. On the one hand, the effects of the amount of explosive material on animals were considered, and on the other, a veterinary examination of the injuries the animals which were being monitored in 2022 sustained.

According to the information obtained by the Task Force, the amount of explosive powder in the harpoons used for hunting minke whales is approximately 30 g, while the amount of powder in the harpoons when hunting for fin whales off the coast of Iceland is currently at approximately 100 g. It was brought to the Task Force's attention, that this does not constitute an increase in the amount of powder being used proportional to the size difference between minke whales and fin whales.

Upon the Task Force's request, an explosives expert from the Coast Guard used a special model to test the estimated difference in the explosive effect of penthrite, based on the different quantities of explosive material being used. This model was based on the grenade exploding in an open space, and blast effect was evaluated based on what the intended effect of the blast would be on a person standing nearby.

As indicated in Table 3, the multiplying effects do not go hand in hand with the multiplied increase in explosive material. It should be reiterated that the figures below are based on a blast in an open space, and one may assume that the explosive effect increases somewhat in a closed space such as inside the chest cavity of the whale.

Table 3 Impact of penthrite quantities

Quantity of penthrite in each grenade (g)	Proximity which is considered likely to cause injury to human lungs (cm)	Proximity which is considered 100% likely to cause injury to human lungs (cm) ⁶
30	67	27
100	100	40
200	126	

Source: The Task Force's summary report is based on information provided by the Iceland Coast Guard.

According to data from the Coast Guard, there is not a linear relationship between the increase in explosive effect and the increase in explosive material, and the benefits of that increase are therefore likely to be minor, unless the increase in explosive material was significant. That, on the other hand, could cause handling of the explosive material to become too risky. Care should therefore be taken when altering the amount of explosive material without a thorough inspection, and taking into account the crew's safety.

⁶ A pressure of about 200-250 psi (e. pounds per square inch) is fatal to humans.

The Task Force believes that great caution must be exercised when altering the amount of explosive material in the harpoons without consulting experts in the field. Thus, it is uncertain whether an increase in explosive material could have a significant impact in reducing the rate of deviations in fin whale hunting.

Conclusions of the assessment

The Task Force believes that it is necessary to exercise extreme caution and to not increase the amount of explosive material in the harpoons without consulting experts in the field first. Thus, it is uncertain whether an increase in explosive material could have a significant impact in reducing the rate of deviations in fin whale hunting.

3.13 Calibration of the Trigger Line

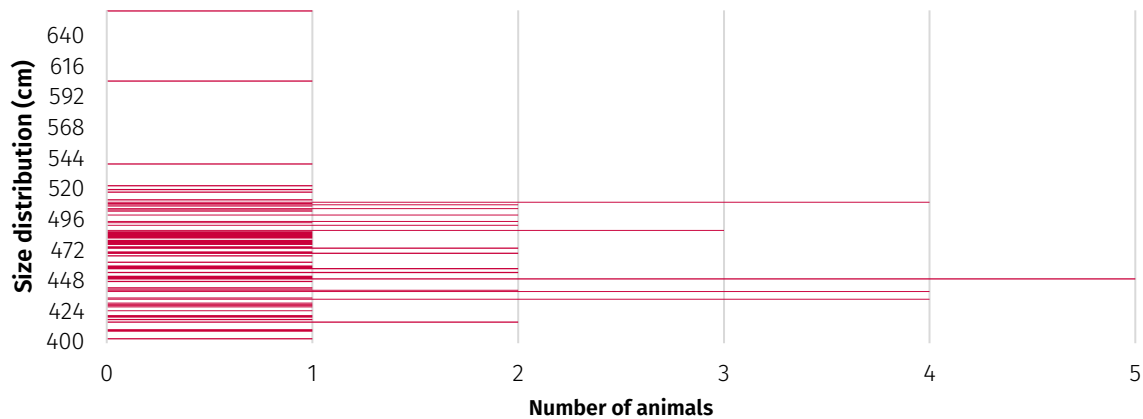
The Task Force examined whether it was possible to extend the harpoon's trigger line so that the harpoon could explode after penetrating further into the animal and therefore reach the primary organs in the abdominal cavity better. This was brought under consideration as the veterinarian's examination of organs showed that in many cases there were little or no visible injuries to major organs, such as the heart, liver, and lungs.

Initially, the harpoon was designed to kill minke whales and was gradually modified to be used in the hunting of fin whales. One of those modifications was to increase the length of the trigger line from 42-43 cm for minke whales to 90 cm for fin whales, with the aim of the grenade exploding at the point inside the animal that would cause rapid death. According to information obtained by the Task Force, the trigger line was shortened from 110 cm to 90 cm in previous years. The Task Force requested information on the reasons for this but was unable to obtain clear information on the matter.

As previously mentioned, fin whales are considerably larger than minke whales, and upon closer inspection of the size and circumference of the animals and the length of the fuse in the grenades, the matter of debate is whether the grenade will detonate at the desired point. This is dependent on variables such as where and how the harpoon hits the animal, as well as the animal's size.

According to studies conducted by the Marine and Freshwater Research Institute, the diameter of fin whales in the optimal target area averages 4.1 m, a median of 4.4 m and has a standard deviation of 1.2 m. Image 23 shows the size distribution⁷ of fin whales during the 2022 hunting season.

⁷ Sizes were obtained from the database of the Marine and Freshwater Research Institute, using variable G1.

Image 23 - Size distribution of fin whales during the 2022 hunting season

Source: A summary from the Ministry of Food, Agriculture and Fisheries based on data from the Marine and Freshwater Research Institute.

The location of the blast within the animal is among the factors that affect how long it takes to kill the animal. Where and how the harpoon hits the animal carries an impact. Specifically, both a hunter's angle of shot, when firing the projectile, and the angle at which the harpoon strikes the animal can affect where and how the harpoon grenade penetrates after it enters the animal, and how deep it penetrates. The shooter has limited control over vertical angles, that angle is largely controlled by the whaling equipment, i.e. harpoon fluctuations, and the orientation of the harpoon when penetrating the animal, cf. Section 3.6. If the recommended target is hit, a 90° vertical angle of the harpoon is most likely to penetrate into the chest cavity. If the angle of shot is correct and strikes the recommended target area, there is a greater chance of the shot being successful, leading to the animal being killed quickly.

Among the items examined by the Task Force was the setting of the trigger line and whether it was too short so that a blast would have an impact outside the center of the animal. The Task Force believes that there may be an increased likelihood that deviations will decrease during the hunting of fin whales, should an explosive projectile detonate centrally in the animal, and in doing so it is more likely to cause extensive damage to the heart and major blood vessels. Other factors such as the sights, the harpoon's trajectory, its flight, and where the harpoon hits the whale will affect how the harpoon penetrates the whale, and how deeply it penetrates. However, there is not enough information to make it possible to assess its viability for the time being.

Conclusions of the assessment

The Task Force has concluded that it is possible that the trigger line may be extended in order for the grenade to detonate closer to major organs, causing greater damage and a quicker death. The Task Force has not evaluated this change, as there is not sufficient basis for further evaluation to assess whether this will reduce the rate of deviations.

3.14 Harpoon tail

It is known that there are only two fixed firing lines on board the whaling vessels. In cases where the animal needs to be shot more than twice, it will thus not be possible to shoot the animal again with a fixed firing line. As indicated in sections 3.4 and 3.6, the firing line not only performs the role of attaching animals to the ship but also providing the harpoon with increased stability. Since loose harpoons are unstable, there is a higher risk of them missing or for the shots to be otherwise unsuccessful. The Task Force observed that, on occasion, harpoons may hit the animal at a flat or a skewed angle.

Hvalur has informed the Task Force that this issue has been examined and that the company believes it has found a method to increase the stability of loose harpoons. Thus, a loose firing line, i.e. harpoon tails, will be attached to the harpoon when a line attached to the vessel is not available.

Conclusions of the assessment

The Task Force has concluded that the intended results of a loose firing line in enhancing the stability of the harpoon's flight may be conducive to improving shooting performance.

3.15 Procedures for assessing whether whales are accompanied by calves

The Task Force considered dividing issues regarding the impact of whaling on calves, pregnant cows, and the significance of cases where the whale cow is lactating. Among other things, the Task Force considered the opinion of the Council of Specialists on animal welfare that it would neither possible to determine the whale's sex from the whaling ships, nor whether the females are pregnant or lactating, or accompanied by a calf, and that the chances of survival for motherless whale calves were next to none.

The Whaling Act prohibits the hunting of whales which are accompanied by calves. It must then be considered contrary to animal welfare, as well as the requirements resulting from the Animal Welfare Act, to catch a whale cow with a milkfed calf, as it is highly likely that the calf will die subsequently. However, nothing in the law prohibits the hunting or killing of pregnant or lactating whale cows, per se, as long as they are not accompanied by a calf. Regardless, whether a whale cow is lactating is significant during monitoring, as a lactating whale indicates a high probability of having been accompanied by a calf when they were caught.

Monitoring efforts revealed that if a whale cow was lactating, this indicates that the animal had been nursing a calf. While the argument could be made that the calf had been separated from its mother before the animal was caught, and was therefore not accompanying the mother, such cases must be considered exceptions. On the other hand, the contrary supposition cannot be made based on the fact that milk is not found in the udder, as calves can accompany other whales, regardless of whether they are still milkfed. Therefore, no definite conclusions will be drawn based on the sole fact that a whale cow was lactating or not.

In light of this, the Task Force examined whether and how whales were being screened for calves during the hunt and how to deal with possible cases of doubt.

According to the information obtained by the Task Force, the blowing of the whales is given special consideration, i.e. whether the crew sees more than one blow and how vigorously the whales are blowing. Reduced blowing would indicate a younger whale or calf. A visual assessment is also used to see whether

calves are seen in the vicinity of the whales that are spotted, and furthermore whether it is a group of whales or a pod. Hvalur's employees commented that if they had any doubt whether a calf was accompanying a whale cow, the animal would be given the benefit of the doubt.

The Task Force obtained further information on this from the inspector from the Directorate of Fisheries who had, among other things, managed monitoring efforts on board the whaling vessels in 2022. The Task Force believes that the utmost care was taken to ensure that whales with calves were not being killed, and that no shots were fired if there was any doubt in the matter. In general, pods of fin whales are furthermore not fired upon. The Task Force also obtained data on the behavior patterns of fin whales, including data from a specialist at the Marine and Freshwater Research Institute, who also has a seat on the Scientific Council of the International Whaling Commission.

In relation to this, the Task Force also examined the distribution of hunted whales by their sex and maturity. Considering the figures from whaling controls in 2022, one might deduce that a proportionately higher rate of females than males had been caught. However, the same inference cannot be drawn when considering previous years where distribution is somewhat more uniform or more male whales caught (Table 4). It was also stated in information from the Marine and Freshwater Research Institute that data on the maturity of animals that were caught by sex indicated that male fin whales were usually younger than the female whales that were caught. However, without additional data and information, the Task Force has not deemed it possible to draw decisive conclusions at this stage.

Table 4 Ratio of hunted animals by sex for the period of 2009-2018

Sex of Fin Whales	2009	2010	2013	2014	2015	2018	2009-2018
Males	54	50%	45%	61%	56%	45%	52%
Females	46%	50%	55%	39%	44%	55%	48%

Source: Based on data from the Marine and Freshwater Research Institute.

The Task Force looked to the fact that, according to the logs made by the Marine and Freshwater Research Institute, few animals have been detected with milk in their udders. During the 2022 season, one whale cow was lactating out of the 148 animals hunted, and during the period 1986 to 2018, a total of 10 lactating whale cows were identified out of the 1,197 animals hunted during that period. Therefore, in total, milk is detected in the udders of less than 1 percent of the whales caught.

These figures indicate that these deviations are not common. However, as previously noted, it is not possible to say whether these numbers reflect the cases where a calf has been accompanying an animal. Although this gives a certain indication that a calf was accompanying an animal, these numbers can be both overestimated and underestimated. For example, the Task Force is aware of cases where a whale cow is suspected to have been lactating, without sampling taking place to confirm lactation.

The Task Force has concluded that it is necessary to establish a criteria on how to screen for calves in the vicinity. It is also not possible to rule out the use of technology in order to screen for calves during whaling. Since there is no further data or information about the use of such equipment during whaling, it is not possible to take a further position on this matter at this juncture.

Conclusions of the assessment

The Task Force has concluded that it might be good to establish criteria and procedures on how to screen for calves during whaling.

3.16 Procedures for assessing the length of whales

The Task Force considered issues related to the impact of hunting whales below the size limit. Among other things, the Task Force gave consideration to the fact that it is not possible to determine the length of whales from the whaling vessels, but under the Whaling Act and the International Convention for the Regulation of Whaling, it is prohibited to hunt fin whales that are less than 55 feet or 16.8 meters in length. Nevertheless it is permitted to catch fin whales that are over 50 feet (15.2 m), provided that the whale meat is then used for human consumption or animal feed in Iceland.⁸

According to the available data on the 997 whales caught in the period 2009-2022, 37 were below the minimum size (16.8 m / 55 ft) and the average length of those animals was 16.1 m. In the period 2009-2022, there were two animals that were below the minimum size, one of which was 14.3 m (2009) and the other was 15.0 m (2018). During the 2022 season, none of the animals caught were under the minimum size limit.

The Task Force asked how the crews estimated the length of the animals on board the vessels. It was stated that no special equipment or criteria were used, and that the estimate was primarily based on the crew's visual estimate. In that case, the crew's experience and training in identifying the size of the animal at sea are the most important factors, since the animals are moving and it can be difficult to determine their exact length.

The Task Force has concluded that the available data and logs suggest that these crew assessments are reliable, all other things being equal. If it is considered that these are insignificant deviations, the Task Force does not think there is any reason for this point to influence the discussion on ways to reduce the rate of deviations in fin whale hunting. Nevertheless, it is pointed out that there is a blanket ban on hunting animals below a certain size, and therefore there may be a reason to implement criteria on how to assess the length of an animal and also how to act in cases of doubt. It is not possible to exclude the possibility of developing other equipment in order to more accurately identify the length and size of an animal. The Task Force has considered, according to information provided by Hvalur, that equipment has been developed that utilizes artificial intelligence to assess the distance of an animal from a vessel, cf. the deliberation in Section 3.7 above.

Conclusions of the assessment

The Task Force has concluded that it might be good to set criteria or procedures on how to estimate the length of a whale during whaling.

⁸ The permissible size limits in fin whale hunting are defined in Paragraphs 1 and 2 of Article 2 of Regulation no. 163/1973 on whaling, and are in accordance with what is set out in Article 15 (1) (b) of the Annex to the International Convention for the Regulation of Whaling.

3.17 The cumulative effect of individual proposals

As noted, many issues may affect the hunting of fin whales, as this involves hunting enormous creatures under uncontrolled conditions, while at sea, where both the vessel and the animal are in motion. Fin whales are the second-largest animal on earth, and therefore powerful ammunition and equipment must be used in order to be able to kill the animal. Therefore, there are also challenges in terms of safety. In addition to this, hunting has not been continuous over the years, so it is possible that the hunters' experience or lack thereof affects the aptitude and ability of individual shooters.

From the available data, it is not possible to state that the causes of deviations in the year 2022 can be attributed to one variable beyond another, or even multiple variables at once. Therefore, it may be possible to attribute the causes of deviations to whaling equipment, whaling methods, the shooter or crew, or external factors. For example, the reason for an animal not being killed with the first shot may sometimes be traced to the harpoon failing to detonate, but in other cases it seems that the projectile has not hit the animal in the target area. Then there were cases where the harpoon hit the animal in the target area and the harpoon detonated but still failed to kill the animal in one shot. The Task Force has concluded that one cannot exclude the possibility that such cases may be attributed to technical issues, concerning the design of whaling equipment, which affect the orientation of the harpoon when it hits the animal. Thus, a shooter can target and hit the animal's target area but the trajectory of the harpoon causes it to not penetrate the animal directly and detonate it in the wrong place, because of how the firing line affects the harpoon's flight. However, a number of variables can affect the flight and trajectory of the harpoon, such as: the center of gravity of the harpoon itself, the effect of the firing line basket on the way a firing line trails behind the harpoon, the distance of the vessel from the animal when it is shot, and the velocity of the harpoon. Similarly, other underlying factors cannot be excluded from being, in part or entirely, to blame when an otherwise well-prepared shooting fails to produce the desired result. It may be possible to attribute this to how deep the harpoon has penetrated the animal before detonating, or the amount of explosive material being used, to name a few factors.

In view of the above, the Task Force is of the opinion that the cumulative effect of individual variables must be considered when assessing whether it is possible to reduce the rate of deviations in the hunting of fin whales.

Cumulative effect

The Task Force has concluded that the cumulative effect of individual variables is likely to play a role in mitigating the rate of deviations in connection with the hunting of fin whales.

4. Other matters of dispute

4.1 Development of whaling equipment

The equipment and methods used in whaling have, essentially, remained unchanged for a long time. Harpoon grenades are still in use, and the main development of the last few decades has been that explosive material such as penthrite has taken over from black powder, which prompted a shorter TTD during whaling and increased safety regarding the use of the explosive materials. Whaling guns like the 90 mm Kongsberg have not seen much development over the last few decades. Although the export of Kongsberg whaling guns can be traced back to the first half of the last century (Kongsberg 2023), it is safe to say that the market for whaling guns is limited and the manufacturers of those guns are no longer focused on their production. These factors, in addition to the fact that few nations practice whaling commercially (Japan, Norway and Iceland), have affected the development of whaling equipment.

In any case, it is clear that some of the equipment used in the hunting of fin whales is getting on in years, and perhaps there are grounds to consider possible developments if whaling continues over the coming years and decades.

Finally, it is worth highlighting the fact that if the intention is to use live animals for experimental purposes that may cause pain and suffering, then a permit will be required, according to Article 20 of Law no. 55/2013 and Regulation no. 460/2017. The Icelandic Food and Veterinary Authority is responsible for authorizing animal experiments upon a review from the Council of Specialists on animal welfare, cf. Article 5 of the Act. Applications and conditions for the issuing of a permit are subject to the provisions of the Regulation. It must be assessed whether the innovations suggested in Hvalur's proposals are subject to the provisions on animal testing in the Animal Welfare Act.

4.2 Data collection for further assessment of the causes of deviations in whaling

In order to assess the actual impact of the routes currently being examined by the Task Force, it is clear that additional data and information must be obtained. To that end, it is necessary to review what information is being obtained through whaling controls, as well as through greater cooperation with the permit holder. One might also consider changing the procedures of the regulatory bodies when individual deviations are suspected, so that the causes can be immediately investigated and compared to successful cases, leading to the necessary actions being taken.

As noted, the Task Force considered the proposed remedial actions and the possible causes for the deviations, where it became apparent that numerous causes for the deviations would need to be considered. It follows, that the necessary information in order to detect and identify the causes of deviations may need to be obtained from different parties. In order to be able to process that information, it is clear that the relevant institutions need to work together and, depending on the circumstances, it may be wise to establish a procedure to ensure this, within the confines of the law.

5. Conclusion

The Task Force was instructed to review existing proposals for improvements to the current whaling methods and hunting equipment being used in the hunting of fin whales, provide further proposals, as necessary, and propose feasible alternatives or solutions. The available proposals have been assessed, and further options have been explored that could be considered to be conducive to reducing the rate of deviations in fin whale hunting, with the aim of improving animal welfare.

The Task Force concludes that it is possible to improve whaling methods for the hunting of large whales. There has been little development in the equipment used in whaling over recent years and decades. The technological innovations described above, e.g. the use of artificial intelligence, are indicative of the progress that can take place. The Task Force's observations have largely been limited to practical means in the near term, which includes considerations to limitations imposed by the design of the vessels.

The Task Force has concluded that the submitted proposals and the improvements they aim to induce are likely to have a positive effect on the results of whaling efforts. For example, improved estimation of range and aim is the basis for the harpoon striking the intended target area. Any use of equipment is additionally dependent on the competence of the crew, and therefore it is of great importance that adequate training in the use of that equipment is carried out.

Lastly, the Task Force has concluded that the possible cumulative effects of the existing proposals should be considered when assessing whether they might play a part in mitigating the rate of deviations in connection with the hunting of fin whales. The reason for this is that it seems that the causes of these deviations can be attributed to multiple factors. It is therefore clear that there is no single, obvious solution which will solve the problem. Thus, proposals for remedial actions must be considered in tandem. The Task Force has determined that one cannot rule out the possibility, considering the descriptions of the different methods that have been assessed, that whaling with modified methods will be more successful than older methods in mitigating the rate of deviations, when considering their possible cumulative effect. However, it is not clear whether the aforementioned proposals will reduce deviations or to what extent.

The proposals for remedial actions, which the Task Force considers most applicable, include a new type of sight, a new firing line, a new firing line basket, improved range estimations, and the training and experience of shooters and crew. In cases when shooting requires a loose harpoon, the Task Force has concluded that a harpoon tail is an improvement.

The Task Force has concluded that it might prove beneficial to set criteria or procedures on how to screen for calves during whaling and on how to estimate the length of whales during whaling, so that whales below the minimum size are not caught.

The Task Force then explored various issues relating to the design and function of an explosive projectile, such as the amount of explosive material being used and the setting of the trigger line, and the Task Force does not rule out the possibility that the changes proposed may be conducive to reducing the number of deviations. However, the Task Force concluded that there were no grounds for such proposals at this time, as this would require further examination and input from experts in the field of explosives and grenade manufacturing. It has therefore not been assessed whether it is practical to modify an explosive projectile. Furthermore, the Task Force would like to highlight that special attention must be paid to safety in this regard.

The Task Force's review has factored in if, and then how, it may be possible to improve the equipment and methods being used to hunt fin whales. As stated, the Task Force believes that various routes can be explored in this regard. However, this does not include an assessment of whether the previously proposed remedial measures are conducive to elevating the welfare of animals, during the hunting of large whales, to an acceptable level, based on the legislation applicable to whaling. This falls outside the scope of work of the Task Force.

The plan was to consult with international experts, but this was not possible due to time limitations imposed on the work of the Task Force. It may be desirable to seek the opinion of more parties in continuation of this work.

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Annex I – Letter of instruction

Establishing a Task Force to review ways of reducing the rate of deviations in the hunting of fin whales.

General: Email

Case number: MAR23070040

Case Keys: 02.03.01 Project Committees and Task Forces - Fisheries

Document owner: Sigurbjörg Óladóttir

Status: Completed

Dates:

Created: 11.07.2023

Date of document: 11.07.2023

Customer Details:

Benedikt Arnason

E-mail address: "Benedikt Arnason"

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User: "Benedikt Arnason" <email address removed >

Date: 11.7.2023 08:28:36.

To: <email address removed >

Subject: Establishing a Task Force to review ways of reducing the rate of deviations

Hello all

following the enactment of Regulation No. 642/2023 amending the Regulation on whaling, the Ministry of Food, Agriculture and Fisheries has continued the work that was initiated before the opinion of the Council of Specialist was available, which focused on seeking ways of reducing the rate of deviations in fin whale hunting. It is important that this work be expedited to the greatest extent possible, in order to enable a regulation to be enacted regarding the continuation of whaling this year, prior to September 1st, when whaling efforts will recommence unless other decisions are made. Should the next few weeks' review reveal any factors that could enable whaling efforts to be conducted in accordance with the law, there is a clear interest in eliminating Regulation no. 642/2023 and allow whaling to start earlier than planned.

In the opinion of the Council of Specialists on animal welfare, the Council formed a position vis-à-vis a portion of the variables which the Ministry had previously considered to include in a regulation to reduce the rate of deviations during fin whale hunting. As previously stated, the Council of Specialists did not consider external factors, such as climatic conditions and wave height, to have had a decisive impact on the effectiveness of this whaling method. It furthermore considered that there was no significant difference between hunters and that, even when the animal was hit from the recommended angle of shot, it could not guarantee the rapid loss of consciousness or quick death of the animal. However, the Ministry considers it necessary to re-submit these questions to experts, with the view of trying to establish, among other things, whether it is possible that the synergetic effect of these factors might have a significant impact on the efficiency of Icelandic whaling. In this regard, please refer to the Ministry's drafted memo from June 16th, which lays out the proposals that the Ministry intends to present to experts and permit holders.

Since Regulation no. 642/2023 was enacted, the Ministry has examined whether and which improvements could be made to the methods and equipment used in the hunting of great whales. As soon as it was decided to postpone the start of whaling for this purpose, work was underway to seek out domestic and international experts, who could provide consultation and help with that work. Among others, the Ministry has met twice with the Icelandic Food and Veterinary Authority and the Directorate of Fisheries for this purpose, in addition to calling for proposals from the Ministry's contacts at NAMMCO and from dr. Edda Elisabet Magnúsdóttir.

At the Ministry's last meeting with the institutions on June 27th, it was decided that a representative from the Ministry, the Icelandic Food and Veterinary Authority and the Directorate of Fisheries would continue this work and submit recommendations on experts and questions that could be submitted to them this summer. The final decision on external experts would then be based on the material that needed to be reviewed. The plan is for the framework of the investigation and the names of the experts to be presented at the next meeting of the Ministry and the relevant institutions, which will be held on Thursday, July 13th. Jón Þrándur Stefánsson from MAR, Þóra Jónasdóttir from MAST and Elín Björg Ragnarsdóttir from the Directorate of Fisheries have been involved in this work.

The Minister of Food, Agriculture and Fisheries has decided to formally establish a Task Force involving the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority; to address this issue. The Task Force is to review the proposals previously presented, provide additional proposals as necessary, submit proposed viable alternatives or solutions, and consult with external experts as needed. Submissions are expected no later than August 23rd. The Task Force is appointed as follows:

Jón Þrándur Stefánsson, the Ministry of Food, Agriculture and Fisheries, Chairman

Ásgerður Snævarr, the Ministry of Food, Agriculture and Fisheries

Þóra Jónasdóttir, the Icelandic Food and Veterinary Authority – alternate is Sigurbjörg Daðadóttir, the Icelandic Food and Veterinary Authority

Elín Björg Ragnarsdóttir, Directorate of Fisheries —alternate is Þórarinn S. Traustason, Directorate of Fisheries.

On behalf of the Minister

Benedikt Arnason

Benedikt Arnason, Permanent Secretary

Department of the Minister

Ministry of Food, Agriculture and Fisheries

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Annex II – Summary of Task Force meetings

Meeting #1 – 13.6.2023 Joint meeting of the Task Force; the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority.

Reported on the appointment of a task force and the work to be undertaken.

Meeting #2 – 21.6.2023 A Task Force workshop

Prepared a draft for the organization of the work ahead.

Meeting #3 – 3.7.2023 Joint meeting of the Task Force; the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority.

Reported on the state of affairs and discussed next steps.

Meeting #4 – 13.7.2023 Joint meeting of the Task Force; the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority.

Reported on the state of affairs and discussed next steps.

Meeting #5 – 21.7.2023 A meeting between the chairman of the Task Force and representatives of Hvalur hf.

Reported on the organization and planned work of the Task Force, the composition of the Task Force was reviewed, among other things. Discussions on consultations with Hvalur hf. and orally communicated that Hvalur's request to be admitted to the Task Force had been rejected.

Meeting #6 – 8.8.2023 Joint meeting of the Task Group; the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority.

Reported on next steps in the Task Force's work and state of affairs.

Meeting #7 – 10.8.2023 A Task Force workshop.

Meetings with experts were arranged.

Meeting #8 – 11.7.2023 A Task Force workshop.

A review was conducted on proposed topics and an inspection from experts.

Meeting #9 – 13.8.2023 Joint meeting of the Task Group; the Ministry of Food, Agriculture and Fisheries; the Directorate of Fisheries; and the Icelandic Food and Veterinary Authority.

Reported on the status of the work being undertaken by the Task Force.

Meeting #10 – 14.8.2023 A Task Force workshop with experts

Reviewing matters of dispute with experts.

Meeting #11 – 15.8.2023 A field trip aboard a whaling vessel and a meeting with Hvalur hf.

Inspection of equipment and a meeting to review the proposals made by Hvalur hf.

Meeting #12 – 16.8.2023 A Task Force workshop with experts and guests

Reviewing disputed issues with experts and those guests who requested a meeting with the Task Force.

Meeting #13 – 17.8.2023 A Task Force workshop

Discussions and review of the draft report.

Meeting #14 – 17.8.2023 A Task Force workshop

Discussions and review of the draft report.

Meeting #15 – 22.8.2023 A Task Force workshop

A meeting with Hvalur hf. to discuss matters of dispute.

Meeting #16 — 23.8.2023 A Task Force workshop

Discussions and review of the draft report.

Meeting #17 — 24.8.2023 A Task Force workshop

A Task Force workshop to draw up a report.

Meeting #17 — 25.8.2023 A Task Force workshop

A Task Force workshop to draw up a report.

Meeting #18 — 26.8.2023 A Task Force workshop

A Task Force workshop to draw up a report.

Meeting #19 — 26.8.2023 A Task Force workshop

A Task Force workshop to draw up a report.

Meeting #20 — 26.8.2023 A Task Force workshop

A Task Force workshop to draw up a report.

Meeting #21 — 27.8.2023 A Task Force workshop

Final meeting of the Task Force, submitting the conclusions to the Minister.

Annex III – Experts and guests attending meetings of the Task Force

Experts and guests attending meetings of the Task Force on 14.08.2023 and 16.08.2023.

Árni Sverrisson, Chairman of the Captains' Association.

Egil Ole Øen, Norway.

Guðjón Már Sigurðsson, the Marine and Freshwater Research Institute.

Jónas Þorvaldsson, Iceland Coast Guard.

Sigurborg Fridadóttir, the Icelandic Food and Veterinary Authority.

Þórarinn S. Traustason, Directorate of Fisheries.

Experts and employees of Hvalur hf. during a visit on board Hvalur 9 and at a meeting at the premises of Brimrún on 15.08.2023.

Ásgerður Snævarr, the Ministry of Food, Agriculture and Fisheries.

Egil Ole Øen, Norway.

Einar Jóhannes Lárusson, Hvalur hf.

Elin Björg Ragnarsdóttir, Directorate of Fisheries.

Guðmundur Steinbach, Hvalur hf.

Halldór Gíslason, Hvalur hf.

Jón Atli Magnússon, Tensor ehf.

Jón Þrándur Stefánsson, the Ministry of Food, Agriculture and Fisheries.

Jónas Þorvaldsson, Iceland Coast Guard.

Katrína Tína Nikolic, the Ministry of Food, Agriculture and Fisheries.

Kristján Loftsson, Hvalur hf.

Njáll Gíslason, Hvalur hf.

Sigurborg Fridadóttir, the Icelandic Food and Veterinary Authority.

Þóra Jónasdóttir, the Icelandic Food and Veterinary Authority.

Þórarinn Sigurður Traustason, Directorate of Fisheries.

ISBN 978-9935-551-01-6



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