TWENTY SEVENTH MEETING OF THE COUNCIL

3 - 4 April 2019, Tórshavn, Faroe Islands

DOCUMENT 09	**REPORT OF THE COMMITTEE ON HUNTING METHODS (CHM)**
Submitted by	**CHM**
Action requested	Take note of the report, including updates on previous recommendations, in particular: ✓ Investigate self-reporting methods for data collection ✓ convening a workshop on alternative methods to collect data on the efficiency of the hunt ✓ finalising instruction video on whale grenade 99 ✓ identified hunts for collection of S&L in member countries **New activities for considerations and approval:** Data ✓ Standardising the National Progress Report to include all data requirements for all committees ✓ NAMMCO Secretariat be depository for database ✓ Looking at deadline for submitting annual data to fit all Committees Workplan ✓ EGM hunting efficiency of small cetaceans, time: 2020 ✓ Workshop/EGM on hunting methods where the combined use of harpoon and rifle is not one weapon, time 2020 (jointly of back to back with EGM on small cetaceans)
Background	

CONTENT

This document consists of:

1. MEMBERS AND MEETINGS

CHM has held two physical meetings, 29 November 2018 (appendix 1) and 7 February 2019 (appendix 2) and one joint Skype meeting 14 March 2019 with the Committee on Inspection and Observation (CIO) and the WG on By-catch, entanglements and live strandings (BYCELS) since NAMMCO 26.

Committee members: Guðni Magnús Eiríksson and Kristjan Loftsson (Iceland), Kathrine A. Ryeng and Hild Ynnesdal (Norway), Nette Levermann and Masaana Dorph (Greenland) and Signar Petersen (Faroe Islands).

Outgoing Chair: Guðni Magnús Eiríksson
Incoming Chair: Norway, name to be confirmed

The next meeting is scheduled later in 2019, date to be confirmed.

2. OVERVIEW OF MAIN DISCUSSIONS AND UPDATES FROM MEMBERS

1.1 Standardising of data requests and submission

Discussions have focused on standardising the information requested from member countries. CHM, together with CIO and BYCELS, **recommends** that Council revise the current National Progress Reports (NPR) submitted by member countries annually to the SC, to be expanded to include information required by all these committees. This would facilitate member countries submitting all requested data to all committees once a year. Presently member countries report annually at different times depending on the various committees meeting schedule.

In a joint effort the CHM, CIO and BYCELS have developed an excel file covering the data categories (catches, by-catch, strandings, ship strikes and hunting and national inspection efforts) and are working on identifying the data requirements within these for the use of all the committees. It is underlined that this template is a working document that needs further consideration and also by the SC and the SC WG on By-catch.

CHM also **recommends** that NAMMCO develop a proper (not excel based) database and the Secretariat be the depository for such a database.

CHM noted that the current deadline for NPR of 1 March is not ideal for CHM. CHM RoP state that it should hold its annual meeting “preferably prior to the Council meetings”, and CHM has normally held these meetings in January/February.

1.2 Struck and lost (S&L)

CHM continues to focus on S&L (NAMMCO24-2016 tasked CHM to look at underlying reasons for S&L) and has further developed and updated the overview document of hunts and known S&L rates. The document has status as a working document.

All members gave updated information related to S&L and reporting requirements (appendix 1, page 8).

CHM like the SC has acknowledged that collection of S&L data represents a big challenge and has discussed the pros and cons of self-reporting by hunters. It has been pointed to the PISUNA project in Greenland, where GoPro cameras were successfully used by participants on a trial basis to document local knowledge.

CHM has noted the following updates on recommendations from NAMMCO26-2018 on S&L to member countries:

- Greenland to collect S&L data on narwhal and beluga
  Response: S&L are reported by hunters. There are presently no plans to do a scientific collection of S&L.
- Iceland to collect S&L data on harbour and grey seals
  Response: reporting S&L by hunters is presently not mandatory but a bill has been introduced to the Parliament addressing the issue. Seal hunt in Iceland is small scale making scientific collection of S&L information impractical.
- Norway to collect S&L data on harp seal
  Response: Scientific collection of S&L will take place in the 2019 season.

1.3 Collection of TTD data and self-reporting

CHM continues to discuss alternative methods of collecting TTD data other than the scientific Norwegian method (appendices 1 & 2, pages 9 & 14).

Acknowledging the high cost implications of the Norwegian method and that this method is not feasible for many hunts, NAMMCO24-2016 had asked CHM to look at alternative methods of collecting these data. CHM had discussed self-reporting as a possible alternative and recommended in 2018 (NAMMCO26-2018) to:

- look further into the possibility of implementing self-reporting methods to describe the killing efficiency of the hunt, and ultimately to
- convening a workshop on alternative methods to collect data on the efficiency of the hunt.

CHM has noted that self-reporting, although vulnerable to criticism for not being a scientific method, could represent a tool to identify possible problem areas with respect to efficiency of the hunts and as such could represent a good supplement to the 10-year sequence of the scientific collection (CHM February 2018).

For most hunts carried out in NAMMCO, self-reporting is the only way data on TTD and hunting efficiency is registered, and both scientists and managers depend on self-reporting to get data necessary for generating advice and making management decisions. As a way forward CHM had discussed organising a Workshop investigating the concept of and various existing methods for self-reporting and to discuss the feasibility of convening a workshop on alternative methods to collect data on the efficiency of the hunt. However, CHM did not reach any consensus and agreed that more time was needed to revisit previous recommendations and work before making a final decision on how to proceed.

Parallel to the discussion on self-reporting CHM had initiated a review of available literature to compare hunting efficiency and TTD between terrestrial and marine mammals. Sam Smith, intern at NAMMCO carried out this review under the supervision of Kathrine Ryeng (appendix 3). The conclusion of the review confirms CHM's position that the scientific method for collecting TTD data used in Norway and Iceland which includes *post mortem* examinations, is the best method available.

1.4 Information from member countries

References on hunting methods and list of laws and regulations in member countries respectively have been updated – see appendices 4 and 5. Greenland has a new Executive Order on large whales (No 9 of 6 December 2018), essentially a revision in line with IWC 67 on extension of hunting period for minke whales to all year and removal of the minimum length limit for hunting fin whales.

Annual (2018) hunting related information on quota, catches, infringements, strandings etc were given.

1.5 Follow up of recommendations from Workshops and Expert Group meetings

To facilitate transparency, visibility, and traceability an overview document depicting all recommendations and responses emanating from Workshops and Expert Group meetings and responses by member countries has been developed (appendix 6).

CHM reviewed recommendations that had not been responded to by member countries and the following updates were noted:

- **WS-2006/2.2.4:** *CHM had advised Iceland and Norway to address hunters with the aim of finding out why the harpoon line breaks.*

  This was explained by the line coming into the propel as a result of the direction of the whale and the boat. It occurs rarely and there are no obvious actions that can be taken to prevent it. The line could also break as it was cut on bones in the whale. However, according to Norwegian hunters this was a problem when the cold harpoon was used in the minke whale hunt.

- **WS-2006/2.3.3**: *meeting between hunters and local government in Greenland to discuss all aspects of hunting. Previously meetings took place every 2 or 3 year and the next was planned for end of 2018.*

  No further information available.

- **EGM-2009/Firearms**: *ammunition studies Norwegian harp seal hunt*
- **EGM-2009/Bleeding out**: *studies on duration of bleeding in harp seals*

  Both ongoing – anticipated some results in 2019.

- **EGM-2011/Struck and lost**
  Greenland has previously reported that instead of all S&L animals being subtracted from the quota and the licence is considered used, a trial has been put in place for walrus, where S&L reports do not result in quota reducing, and the license can be used for a new animal, when the S&L has been reported to the municipality. This is an approach to get an estimate of S&L rates in different part of Greenland.

  This requires a change in the current Executive Order, which is expected to come into force early in 2019, thus the trial is awaiting this change.

- **WS-1999, EGM-2010 and EGM-2015/Rifle hunt in Greenland**
  Several recommendations related to concern for the rifle hunt in Greenland and the fact that it is increasing.

  The hunt is in most areas a subsistence-based hunt with quota allocations set under national political decisions Not followed up due to lack of resources.

1.6 Workplan 2019 – 2020 (appendix 2, page 17)

CHM agreed to **recommend** the following workplan to Council**:**

- **Finalising the video on handling Whale grenade 99 together with Henriksen Verksted.**
  Time: February – June 2019

- **EGM on hunting efficiency of small cetaceans**
  Time: during 2020 depending on status of new lance and availability of Greenlandic data.

  Tentative Terms of Reference
  Overall aim would be to look at efficiency of killing method in regard to animal welfare and safety of the hunter. The EGM should focus on hunting methods where death was not immediately, e.g. types of hunts requiring harpooning before killing in order not to lose the animal, or netting.

  CHM agreed to focus on the hunts where SC has said that S&L represents an assessment problem (relevant species are narwhal and beluga).

  - ✓ Review and assess current hunting and killing methods for small cetaceans
  - ✓ Review and assess information on recent and ongoing research on improvements and technical innovations in hunting methods and gear used for hunting of small cetaceans
  - ✓ Review and assess time to death (TTD) data on the killing of small cetaceans
  - ✓ Give recommendations with respect to possible improvements.

  CHM agreed that invitations should be extended to relevant Canadian territories, Canada and Japan to participate in the EGM.

- **Workshop/EGM on hunting methods where the combined use of harpoon and rifle is not one weapon**
  Time: jointly or back to back with the EGM on hunting efficiency of small cetaceans, because of the overlap in participants and to reduce expenses.

  The focus should be on hunting methods where death is not immediately, e.g. types of hunts requiring harpooning before killing in order not to lose the animal.

- **3rd EGM TTD large cetaceans**
  Time: earliest in 2025 (Recommended schedule NO in 2020, IS in 2024)

Appendix 1

CHM REPORT 29 NOVEMBER 2018

The Committee on Hunting Methods (CHM) met on 29 November 2018 from 09:00 – 16:45 hrs. Present were Guðni Magnús Eiríksson and Kristján Loftsson (Iceland), Kathrine A. Ryeng and Hild Ynnesdal (Norway), Nette Levermann (Greenland), Signar Petersen (Faroe Islands) and Charlotte Winsnes.

Actions arising:

Secretariat:

- Make list of reference on hunting methods (NAMMCO/CHM-2018-02/02) link based for the web.
- Extend the National Progress reports to also include information requested by CHM and other committees.
- Update table on S&L (NAMMCO/CHM-2018-02/05)
- Extend the literature review taking place on terrestrial vs marine TTD to include self-reporting
- Develop draft ToR for Workshop on self-reporting

Member countries:

- Give comments to narrative for instruction video by 31.12 2018 – send to Nette
- Update document 04 – update member countries on hunting information
- Generally, respond to text marked with yellow as input to this report

Greenland:

Finalise narrative for video with Henriksen Mekaniske verksted – investigate price for English version

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1. OPENING REMARKS AND ADOPTION OF AGENDA

The chair, Guðni Magnús Eiríksson, welcomed the participants to the meeting. The meeting reviewed and adopted the agenda and list of documents.

2. UPDATE FROM MEMBER COUNTRIES ON HUNTING METHODS AND REGULATIONS

Documents NAMMCO/CHM-2018-02/02 list of references on hunting methods in member countries and NAMMCO/CHM-2018-02/03 overview of laws and regulations in member countries were updated with new entries from Norway and Greenland. The listing of the Executive Order on polar bears under Greenland to be deleted. To make the references more easily accessible it was agreed to insert web-links where possible.

To standardise the member countries updates and information on quotas, struck and lost (S&L), hunting period, number of active boats etc. table NAMMCO/CHM/-2018-02/04 was presented, discussed and revised. CHM agreed that the appropriate committees for updates and discussion of strandings and infractions were BYCELS and CIO respectively. It was agreed that the table should be structured by stock and management area as opposed to populations.

Greenland informed that the new revised Executive Order regulating the hunt on large whales has been submitted to the Government and will come into force in January 2019. The changes are in line with decisions made at IWC 67 on extension of hunting period for minke whales to all year round and removal of the minimum length limit for hunting fin whales. No new regulations have been put into force in the other members countries since the last meeting.

Recognising that a lot of the same information are presented and discussed in various NAMMCO committees it was proposed that the Secretariat standardised the current National Progress Reports submitted annually by member countries for the use of the Scientific Committee to also include information as required by CHM, BYCELS and CIO. The benefits of organising a proper database at the Secretariat was underlined. A future data base should be developed so that information inputs are standardised and cover all necessary information dealt with by the different committees. Ideally member countries should submit all requested information once a year like with the NPR.

Petersen informed that the spinal lance developed for the pilot whale is also used in the dolphin drives. However, there are concerns that the blade of the lance it too wide for the dolphins and CHM recommended revising the blade for use in dolphin drives.

CHM took note of the information presented by member countries. As a principle CHM recommended that all data should be submitted once a year to the Secretariat through a revised NPR extended with information like hunting method, number of hunting entities (vessels) and hunting period.

3. STRUCK AND LOST (S&L)

Document NAMMCO/CHM-2018-02/05 was presented under this agenda item. It contains the updated table on S&L. The table continues to be a working document. Descriptions of large whales were based on the reports of the Expert Group meetings on assessing TTD for large whales (2010 and 2015), for small whales from the report of the Expert Group meeting assessing hunting methods for small whales (2011), for walrus it was categorised according to stocks and the description of the seal hunts were taken from the document Overview of hunts in NAMMCO member countries (2018).

CHM reviewed the document in detail updating and discussing information hunt by hunt. These discussions are reflected under the member countries below. CHM previously agreed that the best way of calculating S&L rates were as the average of the annual rates for a range of years, including the information of the range.

Struck and lost is defined as animals being targeted/hit without being retrieved. This gives two scenarios –the animal is killed and then lost, or the animal is injured and lost. Both scenarios are of concern for CHM from an efficiency and animal welfare point of view.

CHM emphasised that to consider S&L issues from an efficiency and animal welfare perspective does not require accurate numbers to identify hunts of special concern. For a hunt to be defined as problematic it must be of a certain magnitude. A high S&L rate in a small-scale hunt with annual catches in the range of 10 – 20 animals is not necessarily of great concern. CHM reiterated that the focus would be to identify priority hunts where S&L are thought to be high and where the catches are relatively high. CHM had previously agreed that S&L data for large whales were reliable, so these hunts did not represent a priority. The focus should be on the

small whale and seal hunts to get reliable S&L data. To this end target hunts described in more detail below under member countries - had been identified and endorsed by Council.

The overview should ideally be structured by type of hunt – however for certain species different stocks were hunted using the same method but had different S&L rates. In these cases, all the different stocks would be listed.

Faroe Islands

There is no quota for drive hunts and hunter's estimation of S&L and paper-based S&L rates are thought to be the same. NAMMCO SC advice on the sustainability of current removals has never included S&L and S&L rates used in NAMMCO advice is thus not applicable. NAMMCO SC has not given any advice on harbour porpoise and grey seals.

J. Olsen (doc 07 presented to the Expert Group meeting on small whales in 2011) referred to a study undertaken from 2005 – 2006 showing a S&L rate of 0 %. The method (drive) with whales being beached before the killing takes place means that the whale is stuck on the sea floor with very little probability to escape. In case of an escaped injured whale the circle of boats surrounding the beaching would be able to retrieve it. No such incidents are known to have happened.

Faroe Island's Executive Order No. 9 from 26 January 2017 states that the Sheriff (Sysselmannen) is responsible for reporting from the drives. For the harbour porpoise it is the hunter's responsibility to report the catch to the Sheriff. The regulations do not refer to struck and lost only catches.

Grey seals are killed for reduction purposes around fish farms. They are shot and not retrieved. Executive Order no 50 of 30 April 2018 on aquaculture states that all fish farms must report annually to the Food and Veterinary authorities all removals of seals whether they are killed or dead from other reasons. S&L seals are by default reported as part of the total removal number and since animals are usually not retrieved the S&L is set at 100 %.

Greenland

For the large whales there is no S&L rate used in the NAMMCO SC quota advice as these are strikes and not catch quotas. This means that S&L are included in the quota. CHM has previously agreed that collection of S&L data for large whales were controlled and that the big challenge was with respect to the small whale hunts.

Narwhal and Beluga are the only small whales with quota in Greenland. Advice are given by stock and therefore this is reflected in the table as the quota and S&L rates differs. There have been reports of very few catches and also sightings of beluga in east Greenland, but the SC is not in a position to give advice, hence no quota applies to these animals. Also, a small fraction of the quota – approximately 20 – 30 animals annually - are taken with nets where the S&L is anticipated to be near 0%.

The other small whales - bottlenose whale, killer whale, pilot whale, harbour porpoise and dolphins – have no quota and therefore the question of S&L rates in NAMMCO SC advice and national quota settings are not applicable for these species. The hunters are obliged to report S&L for these hunts like for all hunts in Greenland.

For the seal hunts the same applies – no quota but self-reporting by the hunters. The exception is the harbour seal which has been protected since 2010.

Walrus advice are given by stock and the S&L rates are reflected in the table.

Greenland informed that no steps had been taken due to lack of resources to follow up the recommendation from NAMMCO 26 (2018) to collect S&L data on narwhal and beluga. They represent important subsistence hunts where presently catches are reported with S&L included, and the S&L rates used in assessment models are very high due to uncertainty on S&L rates.

Iceland

Reporting by hunters is mandatory for the whale hunts in Iceland. Like for the Greenlandic large whale hunts there is no S&L rates used in the NAMMCO SC advice or national advice. However, the Directorate of Fisheries has calculated S&L based on hunters reporting for both minke and fin whale hunts and these are reflected in the table.

In Iceland grey seal and harbour seal are hunted, but seal hunt in Iceland is small scale. Part of the seal hunt is done at river mouths for reduction purposes (grey seal). Iceland informed that no steps had been taken to follow up the recommendation from NAMMCO 26 (2018) to collect S&L data on harbour and grey seals. The last meeting had noted that only fragmented reporting exists on seal hunts in Iceland and that there was a need for improvement.

Norway

Self-reporting by hunters of S&L is mandatory for whalers via the electronic logbook. In 2018 the hunters reported 2 animals S/L out of a total catch of 454. For the period 2010 – 2015 the Directorate of Fisheries has calculated S&L based on both sampling and hunters reporting and these are reflected in the table

For the pack ice sealing operations there has not been a requirement to report S&L only catch. Not equipped with electronic log books the sealers are obliged to submit a catch logbook to the Directorate of Fisheries upon their return from the hunting fields. In addition, the sealing vessels have an inspector onboard during the entire hunting period.

In 2019 the sealing vessels will report S&L for the first time. This is a direct response to the recommendation from NAMMCO 26 (2018) that Norway should collect S&L data on harp seals. Young seals float due to blubber thickness and are easily retrievable, whereas adult seals are thinner and may sink. It is therefore anticipated that S&L may happen when hunting adult seals but that this represents very marginal numbers. The pack ice hunt is interesting because no specific information exists on S&L furthermore it represents a very “easy” hunt to collect S&L rates and would as such be a valuable exercise.

CHM noted the updates to the table and recommendations and agreed to postpone discussing methods for collecting S&L until a future meeting when the table would be finalised.

4. COLLECTION OF TIME TO DEATH (TTD) DATA

NAMMCO 26 endorsed the CHM recommendations:

- Looking further into the possibility of implementing self-reporting methods to describe the killing efficiency of the hunt.
- Convening a workshop on alternative methods to collect data on the efficiency of the hunt.

At the last meeting CHM agreed that it would be interesting to compare self-reporting by hunters with the controlled scientific method. One idea had been to analyse already collected

Norwegian data together with Greenlandic data to see how these compared. Another idea was to make preliminary studies on-board a Norwegian whaling vessel during the 2018 season.
Ryeng reported that she had been onboard a whaling vessel in the 2008 season and had discussed self-reporting with the hunters. In her opinion, self-reporting has an inherent weakness due to the fact that the data are reported by the hunters themselves, which may be criticized as a non-reliable way of reporting sensitive information such as TTD. Hence, such data should continue to be collected by independent and skilled observers. However, if self-reporting of TTD is to be used for some purpose, it should be accompanied by some sort of scientific documentation to be credible.

On the issue of making a comparison of Norwegian and Greenlandic data the CHM recognised that this would be feasible. However, logically the different ways of collecting the data may affect the TTD estimates as well as the uncertainty of the estimates.

The established standardised method of colleting TTD data used in Iceland and Norway for the whale hunts is the best and most accurate method, however self-reporting generates valuable information every year with respect to the efficiency of hunts and it is the prevailing method for most of the hunts in NAMMCO. Scientists and managers depend on self-reporting to get essential and necessary data for generating advice and making management decisions. CHM acknowledged the importance of developing the best possible methods for self-reporting by hunters and agreed that the best way forward was to organise a Workshop investigating the concept of and various existing methods for self-reporting. The Secretariat would draft a ToR for consideration at the next meeting.

CHM had tasked the Secretariat to undertake a review of available literature on hunting efficiency in terrestrial and marine mammal hunts. The review had now been inititated and was being carried out by the NAMMCO intern under the supervision of Katrhrine Ryeng. CHM proposed that this review be extended to also include self-reporting of the efficency of hunts.

5. OTHER ISSUES DERIVING FROM NAMMCO 26

NAMMCO 26 supported that the instruction video developed by Greenland in collaboration with Henriksen Mekaniske Verksted on the handling of the penthrite Whale grenade-99 be finalised for the use of all interested NAMMCO countries.

The last meeting reviewed the video and agreed that the committee would discuss and agree on the narrative by correspondence. One general remark made was to insert arrows on the drawings for the different elements of the grenade. Furthermore, it was agreed look into the financial aspects of making the video in English for the use of all members.

No progress had been made since the last meeting. To accommodate progress all CHM members were given both the video and the text (both original and one with comments from Egil Ole Øen) at the meeting. CHM agreed to send comments to Nette Levermann by 31.12 2018 after which time she would finalise the video in cooperation with Henriksen Mekaniske Verksted.

6. WORKPLAN 2019-2022

Document NAMMCO/CHM-2018-02/06 was presented under this agenda item. It gives an overview of all recommendations and responses from all Workshops and Expert Group meetings organised by the CHM and the member countries responses.

CHM reviewed the document and updates where noted on the following recommendations and responses:

- **WS-2006/2.2.4***: CHM had advised Iceland and Norway to address hunters with the aim of finding out why the harpoon line breaks.*

  This was explained by the line coming into the propel as a result of the direction of the whale and the boat. It occurs rarely and there are no obvious actions that can be taken to prevent it. The line could also break as it was cut on bones in the whale. However, according to Norwegian hunters this was more often a problem previously, when the cold harpoon was used in the minke whale hunt.

- **WS-2006/2.3.3**: *meeting between hunters and local government in Greenland to discuss all aspects of hunting. Previously meetings took place every 2 or 3 year and the next was planned for end of 2018.*

  No further information available.

- **EGM-2009/Firearms**: *ammunition studies Norwegian harp seal hunt*
- **EGM-2009/Bleeding out**: *studies on duration of bleeding in harp seals*

  Both ongoing – anticipated some results in 2019.

- **EGM-2011/Struck and lost**

  Greenland has previously reported that instead of all S&L animals being subtracted from the quota and the licence is considered used, a trial has been put in place for walrus, where S&L reports do not result in quota reducing, and the license can be used for a new animal, when the S&L has been reported to the municipality. This is an approach to get an estimate of S&L rates in different part of Greenland.

  This requires a change in the current Executive Order, which is expected to come into force early in 2019, thus the trial is awaiting this change.

- **WS-1999, EGM-2010 and EGM-2015/Rifle hunt in Greenland**
  Several recommendations related to concern for the rifle hunt in Greenland and the fact that it is increasing.

  The hunt is in most areas a subsistence-based hunt with quota allocations set under national political decisions Not followed up due to lack of resources.

CHM discussed future work and agreed that the work of the committee would benefit from making a plan for the coming 4 years. As a starting point CHM discussed criteria for future work and agreed on the following*: To focus on hunts where animal welfare aspects are highlighted in recommendations and where improvements are important and possible.*
Based on the discussions during the meeting CHM identified the following priorities - not in order of priority - to be included in a work plan:

Finalising the video on handling Whale grenade 99- January/February 2019
Workshop on self-reporting fall 2019
Focus on the rifle hunt for minke whales in Greenland

Focus on netting as hunting method – narwhal/beluga/ringed seals
EGM small cetaceans – last meeting in 2011 and Greenland has new data
EGM large cetaceans – Norway to collect TTD in 2022 according to recommendations
Spinal lance revision for the white-sided dolphin

CHM agreed to make the work plan a standard agenda item and continue the discussion at the next meeting. It was also recognised that finalising the video and planning the Worksop would be a priority for the next meeting.

7. ELECTION OF OFFICERS

The member countries have agreed to a rotation plan for the various committees in NAMMCO. This is to ensure balanced representation between the members. This means that the committees cannot freely choose among its members anymore as the country filiation will be fixed by the rotation plan.

Iceland took over the chair in 2017 for 2 years and the chairmanship ends after the next Council meeting in April 2019. Next in line is Norway.

8. NEXT MEETING

The next meeting was scheduled for 7 February 2019 in Copenhagen.

9. AOB

No issues were raised under this agenda item.

10. ADOPTION OF THE REPORT

The report was approved by correspondence on 21 January 2019.

Appendix 2

CHM REPORT 7 FEBRUARY 2019

The Committee on Hunting Methods (CHM) met on 7 February 2019 at the Greenland Representation in Copenhagen. Present were Guðni Magnús Eiríksson (Iceland), Kathrine A. Ryeng and Hild Ynnesdal (Norway), Nette Levermann (Greenland), Signar Petersen (Faroe Islands) and Charlotte Winsnes. Kristján Loftsson (Iceland) participated via phone.

Actions arising:

Secretariat:

Secretariat investigate database possibilities with a view to how other organisations like the IWC are doing it.

Greenland:

Finalise narrative for video with Henriksen Mekaniske verksted and investigate price for English version.

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1. OPENING REMARKS AND ADOPTION OF AGENDA

The chair, Guðni Magnús Eiríksson, welcomed the participants to the meeting. The meeting reviewed and adopted the agenda and list of documents. It was noted that document NAMMCO/CHM-2019-01/05 draft Terms of reference had not been prepared.

2. INFORMATION FROM MEMBERS

Documents NAMMCO/CHM-2019-01/02 and NAMMCO/CHM-2019-01/03 references on hunting methods and list of laws and regulations in member countries respectively were updated with amendments from FO and NO – see appendices 4 and 5.

CHM had previously (CHM November 2018) agreed to recommend that Council that the National Progress Reports (NPR) currently submitted by member countries annually to the SC be expanded to also include information required by CHM, BYCELS and CIO. This would facilitate member countries submitting all requested data to all committees once a year. Presently member countries report annually at different times depending on the various committees meeting schedule.

Document NAMMCO/CHM-2019-01/06 contained a draft excel file developed by the Secretariat. It reflects CHM discussions at the last meeting and similar discussions held in CIO and BYCELS pertaining to what data should be requested in addition to the data already submitted through the NPR. Recognising that the members of CHM and BYCELS largely overlap (with the exception of Loftsson who only meet in CHM) the meeting included the categories of by-catch, strandings and ship strikes. Hunting effort data, although a CIO concern, was also incorporated in the database. The presented excel file thus covered the data categories required by all these committees i.e. catches, by-catch, strandings, hunting effort and ship strikes.

CHM reiterated its **recommendation** that NAMMCO develop and keep a proper database at the Secretariat. It was emphasised that such a database would require suitable soft wear – excel would not cover all needed functionalities – and it was recommended that the Secretariat investigate possibilities with a view to how other organisations like the IWC are doing it.

The discussion on a future database touched upon different issues like:

- The current deadline for NPR of 1 March is not ideal for CHM. CHM RoP state that it should hold its annual meeting "preferably prior to the Council meetings", and CHM has normally held these meetings in January/February.
- The importance of a clear and detailed description and definition of type and format of requested data. Ideally all data columns should be accompanied with a note depicting format and explaining type of data where necessary.
- Aggregated versus individual data. For catches including hunting effort, by-catch of small cetaceans and pinnipeds aggregated data are sufficient. Individual data should be reported for incidents of entanglement including by-catch of large whales, strandings and ship strikes CHM underlined that fishing gear is the most important factor with respect to mitigation of by-catch whereas time of year is less important.

  CHM also noted that it is essential to define whether it is estimates or real numbers that are submitted.

- Re. catches whales:
  It is not customary to ask hunters to report if they use the secondary weapon thus in the database the reference should be first/primary weapon. Number of active vessels/skiffs/drives should be reported where applicable
- Re. catches seals:
  Norwegian seal catches operate with 2 pups as the equivalent of 1 adult seal. Number of vessels is only registered in relation to the pack ice sealing in Norway, and for the other countries there are no available information on platforms.

  CHM discussed whether culling of seals i.e culling of grey seals around fish farms in the Faroes, should be included in the catch table or not, and agreed that for the time being it should be included.

CHM amended document 06 based on its discussions. Time did not permit a full review of all the categories in the document and Levermann volunteered to continue standardising the table after the meeting. A joint skype meeting of CHM and BYCELS was held 14 March discussing the tables as these had been further developed by Levermann (catches including hunting effort, by-catch, strandings and ship strikes). CHM agreed that this was a working document and before finalising it would be important to forward it to the SC WG on By-catch for input.

3. WORKSHOP ON HUNTERS SELF-REPORTING OF DATA

CHM recognised that the issue of self-reporting had been part of the overall follow up of tasks given to CHM by Council at NAMMCO 24, NAMMCO 25 and NAMMCO 26. Furthermore, it was noted that the discussion under this agenda item overlapped with discussions under agenda items 5 Workplan and 6 Recommendations from Council 26 below.

For the benefit of summarising actions and discussion in CHM leading up to the present meeting the Chair noted that NAMMCO 24 had asked CHM to focus on the 2 following main issues and give recommendations on how to best deal with these:

To look at alternative means of collecting standardised TTD data:
Council had previously agreed that TTD and IDR data should be monitored at 10-year intervals except if special circumstances dictated a more frequent sequence. Acknowledging the high

cost implications of the scientific method established by Norway to collect TTD data and also that for some hunts this method is not feasible, Council had asked CHM to look into the possibility of alternative methods that might be used.

CHM had responded by suggesting to

- look further into the possibility of implementing self-reporting methods to describe the killing efficiency of the hunt, and ultimately to
- convening a workshop on alternative methods to collect data on the efficiency of the hunt.

To review the underlying reasons for struck and lost (S&L):

In its discussion on S&L, CHM like the Scientific Committee has acknowledged that the collection of S&L data represents a big challenge. Both committees have noted that a possible solution to identify reasons for and to estimate the extent of S&L could be self-reporting by hunters. CHM has in previous meetings commented on the successful project PISUNA in Greenland, where GoPro cameras were used by participants on a trial basis to document local knowledge. Thus, in relation to S&L, self-reporting has been discussed as a means of obtaining better information.

Parallel to the discussion on self-reporting CHM had asked the Secretariat to initiate a review of available literature to compare hunting efficiency and TTD between terrestrial and marine mammals. CHM has repeatedly expressed an interest in obtaining an overview of what has been done on TTD measurements for terrestrial animals, especially game animals. Sam Smith, intern at NAMMCO had been tasked to undertake the review which was contained in document NAMMCO/CHM-2019-01/04 *Overview of recent developments in time-to-death reporting for hunted terrestrial species* (appendix 3). Smith had carried out the review under the supervision of Kathrine Ryeng.

Ryeng presented the review which show that the hunting of marine mammals has been subject to substantial scrutiny for decades. Consideration for animal welfare outcomes has led to the development of a quantitative framework to assess hunting methods. Reporting time-to-death, the proportion of animals rendered instantaneously insensible, as well as *post-mortem* examinations, allows the humaneness of hunts to be inferred and further improved.

Knudsen (2005) had noted that the welfare of other animals during hunting is rarely assessed through combined *ante*- and *post-mortem* observations. However, recent work conducted in Australia represents considerable efforts made in assessing welfare outcomes using the framework parameters developed for large cetacean hunts. The work documented in the thesis by Hampton (2017) has successfully demonstrated the application of *ante-mortem* parameters such as time-to-death, instantaneous death rate, and wounding rate (a rough analogue to Struck-and Lost), in the assessment of terrestrial management programmes. Assessments were conducted on the lethal control of European rabbit (*Oryctolagus cuniculus*), eastern grey kangaroo (*Macropus giganteus*), feral dromedary camels (*Camelus dromedarius*), and feral horses (*Equus caballus*) - the latter two utilising helicopter shooting; a controversial method in Australia. With *post-mortem* observations additionally considered, the work presents the first application of the large cetacean framework in a terrestrial welfare assessment programme. Furthermore, welfare outcome variability dependent on projectile type have also been quantified, as well as flight behaviour of conspecifics, thus broadening the scope of the assessment framework. Additionally, in the evaluation of welfare in lethal control of feral horses using helicopters, a chase-time has also been determined that can be combined with

time-to-death to give time-frame for the whole hunt. The incorporation of this parameter is significant due to its broader scope for quantifying stress during a hunt.

CHM acknowledged these studies and noted the importance of including additional welfare variables, such as chasing time in the overall welfare assessment where relevant.

CHM complimented Sam Smith for his very thorough work and excellent summary of his findings. An important outcome of the review is that within science on hunting methods and animal welfare, scientists on terrestrial mammals have acknowledged the scientific methods developed by Dr. Egil Ole Øen, Norway (Øen EO, 1995) in Norway to measure time to death (TTD) and instantaneous death rate (IDR) for marine mammals.

The conclusion of the review confirms CHM's position that the scientific method for collecting TTD data used in Norway and Iceland which includes *post mortem* examinations, is the best method available.

CHM also recognises that for most of the hunts carried out in NAMMCO, self-reporting is the only manner in which TTD and hunting efficiency is registered. Many hunts take place in such an opportunistic manner and under challenging conditions precluding planning aimed at efficient scientific studies carried out by inspectors/observers. In addition, post mortem examinations require veterinary knowledge and expertise, something that is not always easily available.

Previously CHM has discussed the idea of comparing self-reporting by hunters with the controlled scientific method through

- analysing already collected Norwegian data together with Greenlandic data to see how these compared and
- carrying out preliminary studies on-board a Norwegian whaling vessel during the 2018 season.

The idea behind was to obtain information on how the results of self-reporting would compare to the scientific method. However, comparing data that is collected by different methods may affect the TTD estimates as well as the uncertainty of the estimates and CHM did not recommend taking this further.

It had previously agreed that self-reporting, although vulnerable to criticism for not being a scientific method, could represent a tool to identify possible problem areas with respect to efficiency of the hunts and as such could represent a good supplement to the 10-year sequence of the scientific collection (CHM February 2018). Recognising that scientists and managers depend on self-reporting to get essential and necessary data for generating advice and making management decisions, CHM had agreed that it would be important to explore what could be the best possible methods for self-reporting. As a way forward CHM had suggested to organise a Workshop investigating the concept of and various existing methods for self-reporting and to discuss the feasibility of convening a workshop on alternative methods to collect data on the efficiency of the hunt.

With reference to Councils endorsement of CHMs recommendation to look into the possibility of developing a simple method to assess TTD (probably involving self-reporting) CHM discussed whether to organise a Workshop on self-reporting or not. This discussion on developing alternative methods was initiated in recognition that the "Norwegian" scientific method was not feasible for all hunts in NAMMCO. Several different aspects came up:

- A more technical and theoretical Workshop to look at what is possible within existing technologies
- Extending the topic to killing efficiency in a broad sense
- To prioritise the limited resources available most efficiently – to critically look at what should be the focus of CHM – the anticipated outcome of a Workshop must correspond to a probable use and must be weighed up against other important issues like improving the animal welfare outcomes of certain hunting methods where the animal sinks when dead, i.e. hunts that require the animal to be harpooned first in order not to be lost. Examples of such hunts could be the minke whale rifle or the walrus hunts in Greenland.
- Bearing this in mind, the question would be if it is an optimal use of resources to monitor the Norwegian and Icelandic hunts between the 10-year intervals when the killing efficiency is documented to be high?
- Should all hunts be included in a Workshop on self-reporting? Is there any meaning in improving the way of self-reporting for a hunt that is known to have a poor animal welfare outcome?

Various suggestions were discussed without any concrete decision taken and it was agreed that to propose convening a Worksop was premature. It was agreed to look more closely at the overall workplan – agenda item 5 - and to also revisit previous recommendations and work of CHM before making a final decision on how to proceed.

4. VIDEO ON HANDLING OF THE PENTHRITE WHALE GRENADE-99 ON HARPOON GUNS

NAMMCO 26 supported the work to finalise the instruction video on the handling of the penthrite Whale grenade-99. Greenland had financed the video and it had been developed in cooperation with Henriksen Mekaniske Verksted. NAMMCO 26 welcomed the initiative and supported that the video be further developed so it could be used by all interested NAMMCO countries.

CHM had received the video and the text of the narrative at the last meeting and had agreed to send their comments to Nette Levermann by 31.12 2018 after which time she would finalise the video in cooperation with Henriksen Mekaniske Verksted. Only Norway had submitted comments.

Levermann will follow this up and also investigate the price for English version.

5. WORKPLAN 2019 – 2020

At the last meeting CHM had identified several issues for inclusion in its workplan 2019 – 2020. CHM had also agreed that the main criteria for future work should be*: To focus on hunts where animal welfare aspects are highlighted in recommendations and where improvements are important and possible.*

The identified issues had not been prioritised at the last meeting anticipating further discussion during the present meeting. CHM discussed the workplan and associated tentative time schedule. It was agreed to include activities extending beyond 2020.

Finalising the video on handling Whale grenade 99 together with Henriksen Verksted.
Time: February – June 2019
Responsible: Nette Levermann

EGM on hunting efficiency of small cetaceans
Time: during 2020 depending on status of new lance and availability of Greenlandic data.

FO had informed that the spinal lance developed for the long-finned pilot whales was not optimal for white sided dolphins. CHM anticipated that the blade of the lance is probably too broad and therefore not suitable for the smaller sized dolphin. However, trials should be carried out to identify the best design of a blade for dolphin drives.

GL informed that they have collected the data recommended by the 2011 EGM on narwhal and beluga. The data had not been analysed yet and this will have to be carried out before convening a meeting.

CHM agreed that invitations should be extended to relevant Canadian territories, Canada and Japan to participate in the EGM.

Tentative Terms of Reference
The overall aim of the EGM would be to look at efficiency of killing method in regard to animal welfare and safety of the hunter. CHM agreed that the EGM should give focus to hunting methods where death was not immediately, e.g. types of hunts requiring harpooning before killing in order not to lose the animal, or netting.

CHM agreed to focus on the hunts where SC has said that S/L represents an assessment problem (presently relevant species are narwhal and beluga).

- Review and assess current hunting and killing methods for small cetaceans
- Review and assess information on recent and ongoing research on improvements and technical innovations in hunting methods and gear used for hunting of small cetaceans
- Review and assess time to death (TTD) data on the killing of small cetaceans
- Give recommendations with respect to possible improvements.

Workshop/EGM on hunting methods where the combined use of harpoon and rifle is not one weapon
Time: to be placed together with or back to back with the EGM on hunting efficiency of small cetaceans, because of the overlap in participants and to reduce expenses.

CHM agreed that the EGM focus should on the hunting method where death was not immediately, e.g. types of hunts requiring harpooning before killing in order not to lose the animal.

3rd EGM TTD large cetaceans
Time: earliest in 2025
Following recommend schedule Norway should collect TTD in 2022 and Iceland in 2024.

CHM agreed to forward the list of activities to Council for its approval.

6. RECOMMENDATIONS TO CHM FROM COUNCIL 26 AND RESPONSES TO COUNCIL 27

Recommendations endorsed by Council at NAMMCO 26:

1. Collection of TTD data

- Looking further into the possibility of implementing self-reporting methods to describe the killing efficiency of the hunt.
- Convening a workshop on alternative methods to collect data on the efficiency of the hunt.

With reference to agenda item 3 above CHM finds it premature to plan a Workshop now and will return to Council when its deliberations have been finalised. CHM draws attention to the literature review on TTD and hunting efficiency in terrestrial mammals which reiterates that the scientific methods used in marine mammal hunts are considered the best method to assess TTD at present and thus has been utilised for terrestrial mammals.

2. **<u>Struck and lost recommendations to member countries:</u>**
   - Greenland to collect S&L data on narwhal and beluga
     Response: S/L are reported by hunters. There are presently no plans to do a scientific collection of S/L
   - Iceland to collect S&L data on harbour and grey seals
     Response: reporting S/L by hunters is presently not mandatory but bill has been introduced to the Parliament addressing the issue. Seal hunt in Iceland is small scale making scientific collection of S/L information impractical.
   - Norway to collect S&L data on harp seal
     Response: Scientific collection of S/L will take place in the 2019 season.

Appendix 3

OVERVIEW OF RECENT DEVELOPMENTS IN TIME-TO-DEATH REPORTING FOR HUNTED TERRESTRIAL SPECIES

In 2005, Knudsen published a review of the criteria used to assess insensibility in hunted whales in comparison to other species. Within this review, it was noted that official criteria have only been considered when applied to humans or large whales. Following that, several studies on terrestrial species were discussed that purported to assess hunting efficiency. However, lacking in these studies were quantitative data related to insensibility and time to death (TTD).

The issue of animal welfare has been discussed at the International Whaling Commission (IWC) since the 1950's, prompting increased scrutiny of hunting methods (IWC 1959, Knudsen 2005, Gales *et al.* 2008). With a view to increasing hunt efficiency, improve animal welfare outcomes, and increase hunter safety, changes were made to hunting methods and the use of cold harpoons was largely abandoned. This effort culminated in the development of the Norwegian "Whale Grenade-99", leading to significant decreases in TTD, and increases in the Instantaneous Death Rate (IDR – the proportion of animals killed instantly during a hunt) (Øen 1995). With the increased opposition to whaling, there was even more impetus to demonstrate that this form of harvest could not only be sustainable, but also as humane as other practices that involve the slaughter of animals. Therefore, following the North Atlantic Marine Mammals Committee (NAMMCO) Committee on Hunting Methods Expert Group meetings of 2010 and 2015, it was acknowledged that a further review of the literature was necessary to see if quantitative data on TTD was available for terrestrial mammals.

After online searches of relevant journals and literature sources, there remains few quantitative assessments of hunting methods that assess time to death in terrestrial animals. However, since 2014, several papers have been published in the journals of *Wildlife Research* (Hampton et al. 2014, 2017, Hampton & Forsyth 2016), *Animal Welfare* (Hampton et al. 2015), and the *Wildlife Society Bulletin* (Hampton et al. 2016) by J. O. Hampton. This body of work was subsequently included in the author's thesis submitted for the Doctor of Philosophy degree at Murdoch University, Australia (Hampton 2017).

Hampton's thesis and associated papers discussed their findings with reference given to the extensive information on cetacean hunting methods. It was acknowledged that a framework has been developed in the hunting of large whales from which the assessment of terrestrial hunting can model (Hampton 2017). Improving animal welfare outcomes for the physical killing of animals should aim for the reduction of the duration of suffering (Lewis et al. 1997, Hampton et al. 2014). The ideal approach would be to record the time to insensibility, yet practical assessment of this is often difficult in the field. Recording TTD is therefore identified as an alternative that has been successfully implemented for cetaceans (Knudsen 2005, Brakes & Donoghue 2006). Hampton's studies have been modelled on similar criteria and methods, incorporating the parameters of TTD and IDR used to evaluate whaling efficiency.

The following sections aim to provide an overview of the recent work conducted in the assessment and evaluation of animal welfare outcomes from terrestrial shooting programs by Hampton. The thesis (Hampton 2017) contains further chapters discussing non-lethal control methods as well, yet these will not be the focus of this review. Instead, the overview will predominantly report on the evaluation of lethal control methods used, namely those using rifles for herbivore management in Australia.

I: Quantitative analysis of animal welfare outcomes in helicopter shooting: a case study with feral dromedary camels (*Camelus dromedarius*).

Introduction

Presented here is a summary of the paper published in *Wildlife Research* (Hampton et al. 2014). This paper addresses the animal welfare concerns arising from helicopter shooting as a method for feral camel population control. Helicopter shooting has been widely employed as a management tool for large mammals (Saunders 1993), particularly for invasive species in Australia where introduced animals such as camels are considered to be overabundant. It was noted by the authors that, while studies exist that evaluate the efficacy of the method from a population control perspective (Choquenot et al. 1999), little effort has been made to quantify the animal-welfare parameters. Further, where the practice has been discontinued, this has been largely due to public opinion shaping policy, and not whether the technique is effective (Nimmo & Miller 2007).

Methods

The methodological approach for assessing the welfare and humaneness of helicopter shooting of camels consisted of two parts; an *ante-mortem* observation, and a *post-mortem* examination. Standard Operating Procedures (SOPs) for helicopter shooting programs are highly regulated in Australia, and those used conducted under the Australian Feral Camel Management Project (AFCMP) were required to follow these, and Civil Aviation Safety Authority regulations.

Two Robinson® 44 helicopters (Robinson Helicopter Co. Torrance, California, USA) were used in the shooting operations. Shooting was conducted from one helicopter, with the other making observations and recordings while flying approx. 30m above the other. Two types of firearms were used in the operations; the M1A (Springfield Armory, Geneseo, Illinois, USA) and the LR-.308 (DPMS Panther Arms, St Cloud, Michigan, USA). Both were semi-automatic, firing 0.308 Winchester® ammunition, and the target area on the animal was either the cranium or thorax. (Hampton et al. 2014). Repeat shooting is required in Australia and as such, a 'fly-back' procedure was performed as detailed along with further SOPs in Sharp (2012).

Ante-mortem observations were performed by recording the interval between the first shot impacting the animal, and the moment at which the animal fell to the ground and did not move (Lewis et al. 1997). This time was recorded as the TTD, yet it was noted that as physiological responses could not be measured, there is a chance that this measure merely represents a time to insensibility. However, it was also mentioned that with the requirement for repeat shooting, it is unlikely that animals will return to sensibility (Knudsen & Øen 2003, Sharp 2012), therefore making this assessment of TTD representative of the duration of animal suffering.

Post-mortem observations were conducted for a separate series of shooting operations. These were conducted by veterinarians within four hours of shooting. Animals were initially assessed for signs indicating a non-instantaneous death. These included blood-trails, evidence of paddling or thrashing, and any disturbance to the substrate in which their carcass was found. Further examinations were conducted to assess the gross pathology of vital organs, the damage sustained by non-target organs, and the location and direction of bullet-tract wounds. Shots to the cranium, thorax and cervical spine were considered fatal (Urquhart & McKendrick 2006, Cockram et al. 2011).

Results

The results of the *ante-mortem* operation described 192 camels, 83% (95% CI: 77-88%) of which were shown to have died instantly (Table 1.). The TTD ranged from 0s to 242s, with a mean TTD

of 4s. 32 animals were not considered to have been killed instantaneously and have a mean TTD of 22s (±11s).

Table 1. Summary of results obtained through *ante-mortem* observations by (Hampton et al. 2014). Mean Time-to-death (TTD, given in seconds) and Instantaneous Death Rate (IDR) is given for 192 camels shot in a helicopter shooting operation.

Parameter	*n*	Mean	95% CI (lower)	95% CI (upper)
TTD (all)/s	192	4.00	1.00	6.00
IDR	192	0.83	0.77	0.88
TTD (non-instantaneous)/s	32	22.00	11.00	33.00

Post-mortem observations were conducted on a total of 715 animals, three of which were found to still be alive upon examination, and thus a wounding rate of 0.4% was given. This is similar to the Struck-and-Lost parameter given in the assessment of the hunting efficiency for marine mammals, yet struck-and-lost may include animals that were killed instantly (Kestin 1995, Knudsen 2005, Hampton 2017). From initial observations of the animal upon inspection, from the gross pathologies of vital organs, bullet wound locations and bullet-hole tracts, an IDR of 77% (95% CI: 74-80%) was inferred. Although inferences of TTD and IDR from *post-mortems* should be treated with caution, This IDR is very close to the above stated IDR given for the *ante-mortem* observations (Table 1.).

Discussion

Further statistical analysis found strong support for the shooter's identity to have affected the proportion of animals rendered instantaneously dead (Hampton et al. 2014). Shooter training, experience, skill, and selection for the operations will likely impact any animal welfare outcomes on an individual basis. Furthermore, vegetation was found to be a factor in reducing the likelihood of achieving improved IDRs. It was also noted by the authors that the stability of the platform, and the need to hit a moving target would likely act as a barrier to improved welfare outcomes. Likewise, harpoon operation, sea conditions, and angle of the shot in minke whale (*Balaenoptera acutorostrata*) are known factors influencing the efficiency of whaling operations (Kestin 1995, NAMMCO 2015). As such, NAMMCO provides a manual to skippers in recognition of the optimum outcomes for animal welfare during the hunts; "NAMMCO Instruction manual for the maintenance and use of weaponry and equipment deployed in hunting of baleen whales in NAMMCO member countries" (Øen 2015).

Repeat shooting has been stated by some to be the product of ineffective first shots, and therefore as an indication of non-humane killing (see Daoust et al. 2013, Butterworth & Richardson 2014). However, as per regional regulations and SOPs (Hampton et al. 2014, 2017), and practices routinely carried out by hunters (Knudsen 2005), the assumption that a secondary shot equates to poor welfare outcomes is not warranted. Indeed, the present study states an average of 2.4 bullet-wounds tracts were present in camels from *post-mortem* observations, even with the inferred 77% IDR.

This study provides the first quantitative evaluation of the animal welfare outcomes for helicopter shooting of a large terrestrial mammal. This is also one of the only studies to produce time-to-death values for terrestrial wildlife shooting, and as such, builds upon the extensive body of work previously conducted in cetacean hunts. It demonstrates that animal welfare outcomes can be judged by a combination of *anti-* and *post-mortem* observations which, when combined, give a wealth of information regarding the humaneness of physical killing methods.

The results of this study by Hampton et al. (2014) are comparable to the IDRs currently achieved by Norwegian minke, and Icelandic fin whale hunts (82% and 84% respectively) (NAMMCO 2015). Similarly, it identifies certain variables that can influence the animal welfare outcomes of hunts, the likes of which are analogous to those observed in whaling operations.

II: A simple quantitative method for assessing animal welfare outcomes in terrestrial wildlife shooting: The European rabbit as a case study

&

III: Improving Animal Welfare in Wildlife Shooting: The Importance of Projectile Energy

Introduction and Methods

The following papers describe the application of terrestrial wildlife shooting on European rabbits (*Oryctolagus cuniculus*). Hampton et al. (2015) assessed the welfare aspects of shooting programs used in population control. It combines *ante-* and *post-mortem* observations and examinations to infer the humaneness of hunting methods. This follows the benchmark parameters developed and established for the study of cetacean hunting methods, such as the recording of time-to-death (TTD), instantaneous death rate (IDR), and *post-mortem* analysis of location of shot (Kestin 1995, Øen 1995, Knudsen 2005, Gales et al. 2008, Hampton et al. 2014). Further, an analysis of Struck-and-lost rate also gives an impression of welfare outcomes for hunted marine mammals. Hampton (2014, 2015) equates this to the wounding rate (WR) obtained from some terrestrial studies. This is not strictly correct as the WR is defined as "the estimated proportion of animals shot but not killed", whereas the NAMMCO definition of Struck-and-lost incorporates all animals hit but not landed, with no indication of whether they are dead or not. Although this may seem a technicality of the different environments, an equivalence of the two terms would not account for those whales that were killed instantly but subsequently lost if, say, the harpoon becomes dislodged (Knudsen 2005, NAMMCO 2017).

Hampton et al. (2016) discusses the importance of projectile choice in improving the welfare outcomes of the shooting of European rabbits. *Ante-* and *post-mortem* observations were made for rabbits shot with two different projectile types; a low energy 40-grain .22 long rifle rimfire (.22LR) bullet, and a high energy 40-grain .222 Remington® centrefire (.222R) bullet. The muzzle energies for each were found to be 198J, and 1433J respectively. The welfare parameters, as discussed above, were contrasted for each projectile used, and conclusions made regarding best practices for improved animal welfare outcomes. Hampton et al. (2015) uses solely .22 long rifle ammunition.

These studies represent some of the few terrestrial studies reporting on *ante-mortem* parameters such as TTD and IDR. They apply the cetacean hunting methods template for assessment to the control of European rabbits, an invasive population where lethal control is considered necessary in Australia (Hampton et al. 2015). Following standard operating procedures (SOPs) as described by Sharp (2016), rabbits were shot opportunistically at night, with distance of shot recorded as an additional variable. Analysis TTD and IDR were calculated as per Hampton et al. (2014), based the framework established for cetaceans. However, for both these studies, it appears that the mean TTD reported includes those in which the TTD = 0. This differs from the studies of Hampton et al. (2014) and Norwegian reporting of TTD in minke whale *(Balaenoptera acutorostra)* hunts, where those reported as instantly dead were excluded from an average survival time reporting (NAMMCO 2015, Øen 2015). The wounding rate (WR) was defined as above; the proportion of animals that were hit but not recovered.

Results

The results of Hampton et al. (2015) reported that rabbits fatally shot had TTDs ranging from 0 to 90 seconds, with 60% (95% CI: 50-69%) killed instantaneously (Table 2.). Out of a total of 141 animals shot at, 127 were hit with 15 individuals (12%) escaping wounded.

Table 2. Animal welfare parameters for shooting of European rabbits as reported in Hampton et al. (2015). Mean Time-to-death (TTD, given in seconds), Instantaneous Death Rate (IDR) and Wounding rate (WR) are given for 127 animals hit during assessment.

Parameter	*Mean*	*95% CI (lower)*	*95% CI (upper)*
TTD/s	12	8	16
IDR	0.60	0.50	0.69
WR	0.12	0.07	0.19

The second study discussing comparing projectile choice (Hampton et al. 2016) demonstrates similar *ante-mortem* results as Hampton et al. (2015) when assessing the welfare outcomes of .22LR ammunition (Table 3.). Following the assessment of .222R ammunition, it was found that welfare outcomes were substantially improved when the higher energy projectile was used. IDR was increased from 66% to 92%, while mean TTD was reduced by 8 seconds (Table 3.). WR also decreased by 4%.

Table 3. Comparison of projectile choice with respect to animal welfare parameters as stated in Hampton et al. (2016). Mean Time-to-death (TTD, given in seconds), Instantaneous Death Rate (IDR) and Wounding rate (WR) are given for 500 animals shot during assessment.

Projectile	*n*	*Mean TTD/s*	*Mean IDR*	*Mean WR*
.22 Long Rifle	224	10 (7-13)	0.66 (0.59-0.72)	0.06 (0.03-0.09)
.222 Remington ®	276	2(1-3)	0.92 (0.88-0.95)	0.02 (0.00-0.03)

Post-mortem observations from both studies identified bullet tract locations as Hampton et al. (2014). Shooting distance was found to be an important explanatory variable when assessing animal welfare outcomes. Increasing shooting distance decreased the probability of hitting a rabbit in one of the recommended locations defined as likely to cause instantaneous insensibility and death (Hampton et al. 2015, 2016, Sharp 2016). The SOPs stipulate a recommended shooting distance; reducing this distance as much as possible is though to improve welfare outcomes for rabbits. The comparison of projectiles also found that successful shooting of rabbits was possible at greater distances when using the .222R given the higher energy profile of this ammunition. *Post-mortem* also found that use of the .222R ammunition also increased the probability of inducing trauma in multiple anatomical zones (Hampton et al. 2016). Even when distance was controlled for following statistical analysis, the .222R ammunition were found to increase animal welfare outcomes derived from *ante-mortem* parameters over the .22LR projectiles.

Discussion

The results obtained from studies observing the shooting of the European rabbits has demonstrated further successful use of the framework developed for hunting method assessment in marine mammals (Øen 1995, Knudsen 2005, Hampton et al. 2015, 2016). Assessment of terrestrial mammal welfare outcomes has demonstrated that a combination of *ante-* and *post-mortem* observations is able to infer parameters such as TTD, IDR and WR. Further, Hampton et al. (2016) also demonstrated the importance of projectile choice when considering welfare improvements. High energy projectiles were able to improve all welfare parameters and enabled more humane physical killing at greater distances.

The higher the wounding rate, the greater the number of animals that escape after being hit. This is widely considered the worst possible outcome of animal killing from a welfare perspective (Bradshaw & Bateson 2000, Hampton et al. 2015, 2016). The duration of suffering experienced by an animal that escapes after being hit by a projectile is unable to be quantified and could be substantial. The above study has shown that increasing the projectile energy by selecting a higher calibre can reduce the likelihood of non-lethal wounding occurring (Hampton et al. 2016). Even when controlled for distance, this equates to increased kinetic energy being transferred to the animal, followed by trauma observed in multiple critical anatomic zones as per standard operating procedures (Sharp 2016).

Potential drawbacks of using higher energy projectiles such as the .222R ammunition were discussed in terms of primary objective of animal killing. Given the higher cost of the .222R over the .22LR bullets (more than 10 times greater), the practicality of using more expensive methods will not suite every situation (Hampton et al. 2016). This can be comparable to the situation where the ammunition determined by experts to be the most efficient, has not always been available in the stores. This has remained a problem in several of the NAMMCO member countries (NAMMCO 1999, 2001). As an example, the collective minke whale hunt in Greenland consists of a multiple of small boats first using large calibre rifles and then attaching several hand-held harpoons to not lose the whale before killing it. This contrasts with larger, single vessels, operating explosive harpoons fired from cannons. Any hunting methods where the combined use of cold harpoons and rifles often results in prolonged TTDs and low IDRs. In this situation, the Greenlandic whalers cannot kill for instantaneous death given the whale's propensity to sink before a harpoon can be attached (NAMMCO 2010, 2015). While this has raised welfare concerns, the lack of whaling vessels, the need for food supply and the geographic isolation of communities practicing the collective hunts has limited animal welfare outcomes (NAMMCO 2015).

Furthermore, there is a concern that, although the .222R ammunition used in Hampton et al. (2016) provided improved welfare outcomes, it also damaged a greater proportion of the target animal. Therefore, if shooting is to be conducted for meat, rather than population control, animal welfare concerns may have to be balanced against the cost of the ammunition and the potential wastage of usable product. Likewise, Daoust & Cattet (2004) observed that accuracy of the shot had less impact on the probability of negative welfare outcomes if the projectile used had a higher energy profile on impact. This may be of greater benefit to wildlife population control than it would be to harvest of wildlife, given the greater potential for damage to usable meat.

Nevertheless, the discussion of projectile choice in regard to animal welfare in terrestrial shooting mirrors the improvements made to whaling operations in the 1980's and 1990's (Øen 1995, 2015, NAMMCO 2015). As parameters have been used to quantify the humane killing of animals, so the understanding of positive and negative outcomes has improved (Kestin 1995, Knudsen 2005, Hampton et al. 2015). In recognition of the work conducted in whaling operations to reduce the intensity of duration of animal suffering, the discussion in Hampton et al. (2016) turned to relevance of projectile choice. Again, quantitative data combining both *ante-* and *post-mortem* observations provide insights into the welfare outcomes of hunting methods in terrestrial shooting.

IV: An assessment of animal welfare for the culling of peri-urban kangaroos

Introduction

The following paper introduces the assessment of animal welfare during night shooting of peri-urban kangaroos (*Macropus sp.*). Eastern grey kangaroos (*Macropus giganteus*) are subject to population control when numbers become over abundant in proximity to human settlements (Hampton & Forsyth 2016). As with the previous studies discussed, questions surrounding the welfare aspects of this practice remain, especially as the target is a charismatic mammal endemic to Australia. Also as in previous studies, both *ante-* and *post-mortem* observations were used in the assessment, enabling the accurate quantification of IDR, TTD and WR. Furthermore, in addition to these parameters quantified for the individual animals, the duration of stress was also quantified for pouch young and conspecifics. The quantification of stress on young animals is particularly important, given that the welfare of 'orphaned' animals has previously received considerable attention (Hampton & Forsyth 2016). The assessment of flight responses of conspecifics may also have implications for animal welfare assessments in other social species.

Methods

Shooting took place at night during June 2015 in the Australian Capital Territory. It took place in the winter months to minimise number of young-at-foot (juveniles outside the pouch) and furred pouch young, which would likely have poorer welfare during the shooting operation (Mcleod & Sharp 2014, Hampton & Forsyth 2016). A shooting team consisting of a driver, an observer and a shooter operated a modified four-wheel-drive-vehicle driven at 5-10kmph around an estate in which the shooting program was conducted. The shooter used a bolt-action rifle, using .223 Remington® calibre ammunition. The rifle was fitted with a telescopic sight and sound suppressor to reduce noise. Typically, shooting is conducted with the use of spotlights (see Hampton et al. 2015, 2016), yet for the purposes of this study, a infrared imaging technology was utilised. Once a kangaroo was spotted, the vehicle was stopped within 75m of the animal, and the marksman aimed for the cranium of the animal, as per standard operating procedures (Commonwealth of Australia 2008, Hampton et al. 2016).

Retrieval of the animals once shot occurred as soon as possible, yet multiple animals including young-at-foot sometimes shot in cohort. Females assessed for presence of pouch young, and these were euthanised through blunt-force trauma or decapitation. An independent veterinary observer recorded *ante-mortem* welfare parameters (TTD, IDR, WR), while infrared video recordings were reviewed later to assess the flight behaviour of conspecifics. Flight behaviour was defined as either the animal remaining calm and stationary after another animal in the vicinity was shot, or an alarmed flight response away from the animal that was shot. The duration of the flight response (FD) was recorded, with those that remained stationary recorded as FD = 0.

Post-mortem examinations were performed to determine the location of the bullet wounds and bullet wound tracts as per Urquhart & McKendrick (2006). This was conducted by an independent observer who also conducted an examination of the euthanised pouch-young.

Results

During the shooting program, 136 kangaroos were shot at, with two animals escaping un-wounded. Of the 134 animals that were hit, 131 animals were rendered instantaneously insensible (Table 4.). For the three animals not rendered immediately insensible, the median TTD recorded was 12 seconds (range = 4-81s). *Post-mortem* observations demonstrated that 98% of kangaroos had bullet-wound trauma to the brain. Young-at-foot (juveniles outside the pouch) were, when present, shot with 60s of the mother (n=17).

Table 4. Summary of *ante-mortem* observations of peri-urban kangaroos described by Hampton & Forsyth (2016). Animals subject to night-shooting, and observed through thermal imaging cameras by independent observers. IDR = Instantaneous death rate; WR = wounding rate (animals escaping after being hit).

Parameter	***n***	***Probability* (95% CI)**
Shot at	136.00	1.00
Hit	134.00	0.99 (0.97-1.00)
Killed	134.00	0.99 (0.97-1.00)
IDR	131.00	0.98 (0.95-1.00)
WR	0.00	0.00

66 pouch young were found in 90% of the females shot (n=72), 57 of which were described as 'unfurred'. Young marsupials without fur, and that have not yet opened their eyelids, are thought to not have sufficiently developed neurological system in order to feel pain and therefore to suffer (Mcleod & Sharp 2014, Hampton & Forsyth 2016). Young were euthanised by either blunt force trauma (furred and unfurred) or decapitation (unfurred). For sentient furred pouch young (n=9), median stress time (duration from pouch removal to insensibility) was 4 seconds (range = 1-10s). Median flight time of conspecifics was 5 seconds, with 22% of animals exhibiting no alarmed flight response. *Post-mortem* examinations confirmed that

Discussion

To the knowledge of the authors, this study represents the first quantified review of animal welfare outcomes in the culling of peri-urban kangaroos. It has implemented the parameters developed for cetaceans to assess hunting methods, and has produced a methodology designed to reduce bias associated with the measurement of these parameters by combining both *ante-* and *post-mortem* examinations (Kestin 1995, Øen 1995, Lewis et al. 1997, Knudsen 2005).

The results obtained show a very high percentage of animals shot and killed instantaneously (IDR=98%). This value is comparable to those obtained in abattoir slaughtering of cattle (*Bos taurus*) described by Grandin (2010), and higher than those observed in the Norwegian minke whale (*Balaenoptera acutorostrata,* 82%) hunt (NAMMCO 2015, Øen 2015). Furthermore the WR, widely considered the worst of all animal welfare outcomes (Bateson & Bradshaw 1997, Hampton & Forsyth 2016), was zero and therefore a very positive welfare outcome.

Duration of suffering for pouch-young was conserved low (median 4s), and the flight time, with a median value of 5s was also relatively low. The fact that 22% of animals exhibited no flight response at all indicates that the behaviour of conspecifics in the vicinity of targeted animals was minimally affected. A number of factors may contribute to this, namely the use of a sound suppressor, the absence of a spotlight, and the habituation of the animals to the presence of humans. These are important considerations for methods designed to improve welfare outcomes in shooting programs. The fact that the behavioural responses of conspecifics were also quantified has allowed appraisal of welfare outcomes for all animals potentially affected by shooting. This will be especially important in animals where social behaviour is perceived to be well-developed. In this study, negative welfare implications for conspecifics were accounted for in the shooting protocol, with the use of suppressors and thermal imaging cameras over spotlights. Both the sound of the shot, and the bright spotlights have been associated with

negative welfare outcomes (Hampton & Forsyth 2016). For marine mammals, the duration of stress of conspecifics during hunting activities may be an important welfare concern, especially with respect to species and methods employed during the hunt.

To summarise, Hampton & Forsyth (2016) have demonstrated a quantitative approach towards assessing welfare outcomes for kangaroo culls, with respect to methods used, and the effects of conspecifics. This study has reported very low duration of suffering and stress experienced by the animals, and this has been evidenced by both *ante*- and *post-mortem* observations. The utilisation of the parameters developed for the assessment of cetacean hunts demonstrates that a quantified approach to assessing welfare outcomes has again be successfully applied to terrestrial animals using this framework. Furthermore, the observations of conspecific behaviour in the vicinity of targeted animals may indicate an area in which the assessment of marine mammal welfare could pursue in further studies.

V: Assessment of animal welfare for helicopter shooting of feral horses

Introduction

In this final paper, Hampton et al. (2017) provides *ante*- and *post-mortem* observations made during population control operations for feral horses (*Equus caballus*) through helicopter shooting. This follows from the initial study, Hampton et al. (2014), where the same technique used in the control of dromedary camels (*Camelus dromedarius*) was assessed. The techniques in question involved the application of the parameters, such as TTD, used to assess welfare outcomes for large cetaceans (Øen 1995). Furthermore, it has long been recognised that time-to-death is not the sole measure of the duration of suffering inflicted upon a hunted animal. The period of time in which an animal is under stress may begin long before the first shot makes contact. This is especially evident when animals are being chased, such as the present study where the shooting platform is a fast-moving helicopter. This defined 'chase-time' can be combined with TTD to give an overall quantification of the stress experienced in the different stages of a hunt.

Methods

Shooting protocol was identical to those used in (Hampton et al. 2014). *Ante-mortem* observations were made using the parameters of TTD and IDR used to assess animal welfare. Unlike previous studies discussed, the present study did not state a wounding rate, instead only gave a minimum estimate of 1% inferred from *post-mortem* (Hampton et al. 2014, 2015, 2016, Hampton & Forsyth 2016). This was however not regarded as reliable since it was estimated from *post-mortem* observations alone (Hampton et al. 2017). Also incorporated into the *ante-mortem* observations was the recording of 'Chase-time'. This was defined as the time from the onset of flight behaviour in response to the helicopter, to the time of the first shot (Linklater & Cameron 2002, Hampton et al. 2017). The value recorded here was combined the TTD to give an overall total time (TT), providing an overall representation of *ante-mortem* stress endured.
Post-mortem examinations were conducted by independent veterinary observers, and the anatomical location of bullet-wounds and bullet-wound tracts were recorded. Further information was also obtained as per Hampton et al. (2014), such as variables associated with shooter skill, vegetation type, and physical condition of the horses. *Post-mortem* observations dichotomised the perceived outcome; whether instantaneous death could be inferred or not.

Results

A total of 937 animals were shot during the helicopter shooting operation. All animals that were chased by the helicopter were shot, 63% of which were regarded to have been rendered instantaneously insensible. For those that were not killed instantly (TTD > 0), the mean survival

time was 19 seconds (Table 5). The range for CT and TT was equivalent, indicating that at least one individual was chased for nearly 11 minutes, before being killed instantly. The wounding rate observed was at least 1%.

Table 5. Summary of *ante-mortem* parameters used to infer welfare outcomes for helicopter shooting of feral horses (*Equus caballus*) as reported by (Hampton et al. 2017). CT= Chase time, TTD = Time-to-death, **TT** = Total time. CT and TT incorporate data recorded for all animals, while the values for TTD solely includes animals for which TTD was greater than zero seconds.

Parameter	Mean/s	Median/s	Range (lower)/s	Range (upper)/s
CT	73.00	42.00	2.00	654.00
TTD (non instant)	19.00	15.00	3.00	242.00
TT	80.00	52.00	2.00	654.00

Post-mortem observations conducted on 630 animals obtained through separate shooting operations demonstrated that the number of bullet-wound tracts ranged from 1-6. 3% of animals did not display at least one bullet-wound in either the cranium, cervical spine or thorax, and an inferred IDR of 70% was estimated from these examinations. This is slightly greater than that which was recorded during *ante-mortem* observations.

Statistical analysis of additional variables found shooter identity, as with Hampton et al. (2014), to be the most important determinant of higher IDR.

Discussion

As with the previous studies, the present example of welfare assessment has successfully applied parameters developed for the assessment of large cetaceans in a terrestrial setting. Further, it has demonstrated similar outcomes for TTD and IDR as reported for feral camels; this is only other animal subject to helicopter shooting that has had associated welfare parameters quantified (Hampton et al. 2014). In addition to these parameters, a key development of the present study is the recording of 'chase-time', and thus quantifying the total duration in which the animal is subject to stress from the hunt (Table 5). This is a key aspect of addressing welfare concerns for hunted animals, and challenges the notion that it is only the physical killing methods that must be assessed. Bateson & Bradshaw (1997) analysed samples from red deer (*Cervus elaphus*) subjected to hunting with dogs, some of which were pursued across 19km of rough terrain. They found an increase in so-called 'stress-hormones' such as cortisol following *post-mortem* examinations. Similarly, other studies have found significant effects of hunting at the population level that can indicate strong physiological responses in species subject to heavy hunting pressure. Bryan et al. (2015) compared hair samples obtained from two populations of wolves (*Canis lupus*); one subject to heavy hunting pressure, and one where this pressure is significantly less. The study recorded higher progesterone, testosterone and cortisol levels in the samples from the heavily hunted population. It is thought that this is an indication of increased reproductive output in response to higher anthropogenic mortality. Specifically, the increased cortisol was thought to reflect social instability among the heavily hunted population, demonstrating the need for physiological effects to be accounted for in management plans for targeted animals.

With the potential for substantial physiological impacts upon hunted animals, both directly and indirectly, the quantification of chase time by Hampton et al. (2017) is an important parameter in assessing the welfare outcomes of hunts. With respect to hunts of large cetaceans, hunts vary between region in terms of methods used in the pursuit of an animal. Using a comparison of minke whale hunts (*Balaenoptera acutorostrata*) in Norway and Japan as an example, the

manner in which the whales are approached has been subject to discussion (NAMMCO 2010, 2015). Norwegian vessels, once a whale has been identified, will try and estimate it's next point of surfacing and attempt to move into position along side the whale without a definite 'chase-phase' occurring in the hunt (NAMMCO 2015, Øen 2015). By contrast, Japanese offshore whaling vessels may actively pursue an animal, sometimes with the assistance of a sonar device and attempt to harpoon the animal during a fast chase (NAMMCO 2010). This difference could be of significant interest to those wishing to assess welfare outcomes in marine mammal hunts. If the duration and intensity of the chase were to be parametrised in the same way as TTD and IDR are recorded, then this will add to the developed framework for hunting methods assessment. Hampton's various papers have discussed how techniques used in the assessment of large cetaceans has been applied in terrestrial setting. The quantification of chase time in horse population management should be considered as a useful addition to the suite of parameters assessed in whaling operations.

Summary

The intensive study of large whale hunts led to the development of key parameters used to quantitatively assess welfare outcomes. The combination of *ante-* and *post-mortem* observations allow an accurate evaluation of the duration and intensity of suffering during the killing process (Øen 1995, Knudsen 2005, Hampton 2017). Knudsen (2005), along with NAMMCO Expert Groups have remarked upon the notable lack of studies quantifying similar parameters in the hunts of terrestrial mammals, especially with regard to time-to-death. Moreover, this is surprising given the disparity between the criticism received by whaling operations in comparison to terrestrial shooting and wildlife management programs. Working with the assessment framework developed for cetaceans, potential terrestrial studies now have a benchmark from which to assess their respective hunting methods.

The work documented by Hampton (2017) has successfully demonstrated the application of *ante-mortem* parameters such as time-to-death, instantaneous death rate, and wounding rate (a rough analogue to Struck-and Lost), in assessment of herbivore management programs. With *post-mortem* observations additionally considered, the work presents the first application of the large cetacean framework for welfare assessment.

Furthermore, the papers associated with the shooting of rabbits, kangaroos, horses and camels evaluate hunting methods, and aim to quantify additional variables associated with the improvement of animal welfare outcomes. Specifically, Hampton et al. (2016) relates TTD, IDR and WR to projectile energy and distance at which animals have been shot, while Hampton & Forsyth (2016) evaluate flight behaviour of conspecifics with regard to efforts made to reduce disturbance. While in the study of helicopter shooting of camels (Hampton et al. 2016), recognition is given to the importance of shooter identity, the use of a helicopter prompted scrutiny of the total duration of stress using this technique for wildlife control. In the study of feral horses, the authors presented the first quantification of the duration of the chase, commencing at the first observed avoidance behaviour from the helicopter shooting platform. Studies demonstrating the physiological importance of stress allow the full appreciation stress and suffering of total duration of a hunt, not just the moment of bullet or harpoon impact. It would be of interest to incorporate chase time into the assessment of marine mammal hunting methods, enabling further improvement of welfare outcomes.

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Appendix 4

LIST OF REFERENCES ON HUNTING METHODS
(Updated February 2019)

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Appendix 5

LIST OF LAWS AND REGULATIONS IN NAMMCO MEMBER COUNTRIES

(Updated February 2019)

FAROE ISLANDS

Parliamentary Act	No 57 of 5 June 1984 on whale hunting, as last amended by Parliamentary Act No 54 of 20 May 1996 No 56 of 19 May 2015 on pilot whale and other small whales, as last amended by Parliamentary Act No 44 of 6 May 2016 No 49 of 30 April 2018 on animal welfare No 43 of 22 May 1969 on weapons etc., as last amended by Parliamentary Act No 81 of 22 May 2015
Executive Order	No 87 of 20 September 2007 on protection of whales 9 of 26 January 2017 on pilot whale and other small whales No 57 of 12 September 1969 on weapons etc. No 74 of 28 June 2016 on registration of shooting weapons, as amended by Executive Order No 92 of 7 September 2016 No 93 of 7 September 2016 on weapon certificate

GREENLAND

Greenland Home Rule Act	No 1 of 16 Mai 2008 on revisions to Greenland Home Rule Act No 12 of 29 October 1999 on hunting No 25 of 18 December 2003 on animal welfare No 29 of 18 December 2003 on nature protection
Executive Order	No 26 of 24 October 1997 on extraordinary check and approval of harpoon cannons No 22 of 19 August 2002 on trophy-hunting and fishing No 20 of 27 October 2006 on protection and hunting of walrus No 16 of 12 November 2010 on protection and hunting of seals No 12 of 16 July 2010 on reporting from hunting and strike of large whales No 13 of 30 December 2014 on hunting licenses for full time hunters No 14 of 30 December 2014 on hunting licenses for part-time hunters No 3 of 27 January 2017 on protection and hunting of beluga and narwhal No 9 of 6 December 2018 on protection and hunting of large whales

Catch registration form (1993-present) "*Piniarneq"*

ICELAND

Law	No 26 of May 3, 1949 on whaling No 40 of June 1, 1979 on amendments to Law No 26/1949 on whaling No 23 of April 17, 1991 on amendments to Law No 26/1949 on whaling (cf. Law No 40/1979) No 92, July 1, 1991 on amendments to Law 26/1949 on whaling (cf. Law No 40/1979 and 23/1991)
Regulation	No 163, May 30, 1973 on whaling No 359, April 6, 2009 on amendments to Regulation No 163 of May 30, 1973 on whaling (cf. Regulation No 304/1983, 239/1984, 862/2006, 822/2007, 456/2008 58/2009 and 263/2009) No 1035, November 2017 on the ban on whale hunting in specific areas.
Minke whaling licenses	Rules in the licenses for minke whaling.

NORWAY

Act of 29 May 1981 No 38	Relating to Wildlife and Wildlife Habitats (the Wildlife act)
Act of 27 March 1999 No 15	Relating to the Right to Participate in Fisheries and Hunting
Act of 6 June 2008 No 37	The Marine Resources Act
Act of 19 June 2009 No 97	Animal Welfare

Executive Orders from the Department of Fisheries and Coastal Affairs:

31 March 2000	Regulation of the practice of hunting minke whales.
11 March 2003	Regulation of the practice of hunting seals in the West Ice and the East Ice
27 February 2014	Regulation of the practice of hunting seals on the coast of Norway

The Ministry of Fisheries and Coastal Affairs and the Directorate of Fisheries issues each year executive orders relating to the participation and governing of the hunt of Whales and Seals.

Appendix 6

OVERVIEW OF HUNTING METHOD-RELATED RECOMMENDATIONS TO NAMMCO MEMBERS AND RESPONSES BY MEMBER COUNTRIES

The document provides an overview of all recommendations to NAMMCO members and responses by member countries and NAMMCO deriving from the workshops and expert group meetings organised by the Committee on Hunting Methods (CHM). Some responses will appear both under country and CHM/Council like the manuals as these represent responses by both. Updated November 2018.

Ref.	Recommendations	FO	GL	IS	NO	Council /CHM
WORKSHOP 1999 - on Hunting Methods						NAMMCO AR 1998, 5.1.2, p 25 Council agreed to proposal from CHM to hold WS on Hunting methods WS-1999. NAMMCO AR 1999, item 5, p. 27 Council endorsed all recommendations from the WS-1999.
	1. Faroe Islands: hunting of long-finned pilot whale		NA	NA	NA	
	The WS notes that the pointed hook is still in use and **recommends** that further effort be made to replace this with the new blunt hook for securing the animals.	The Ministry of Fisheries produced and distributed 620 blunt hooks to the different whaling bays. In addition, whalers can buy it various places. (NAMMCO AR 2001, p. 62.)				
	2. Faroe Islands: killing of stranded northern bottlenose whale					
	Stranded bottlenose whales are killed in the same way as pilot whales. Questions were raised whether this is an adequate method of killing such a large animal, and it was recommended that rifles with adequate ammunition be used for killing stranded whales of this species.	The riffle, calibre .458 round nosed full metal jacket ammunition is placed at the sheriff's office in Suðuroy, where stranding of bottle nose whale happens most frequently. (NAMMCO AR 2001, p. 62) Shooting tests on dead bottlenose whales show that calibre .458 round nosed full metal jacket ammunition is satisfactory (NAMMCO Annual Report 2002, p. 64)				

3. Greenland: hunting of small cetaceans	NA		NA	NA	
3a. Full metal jacket, pointed bullets are used to kill harpooned small whales (beluga and narwhal). Investigations show that full metal jacket, blunt-nosed bullets penetrates bone better. The Workshop recommends that Greenland initiates studies in co-operation with the hunters, testing both pointed and blunt bullets on whale carcasses to determine the best ammunition for use in the hunt.		No systematic study has been carried out, because the studies done in other NAMMCO countries has been available and used for the recommendations. Recommendation on ammunition in Greenland has to be based on animal welfare, availability in all parts of Greenland and economy. The commercial company distributing ammunition and weapons in Greenland are only able to make the most common types of ammunition and calibres available at affordable prices. See also rec. 3 from WS-2001.			CHM 01.2007: the guidelines developed by Olsen and Øen in 2006 may function as a model on how to perform the shooting tests in a standardised way. A prerequisite would be to have enough heads of small cetaceans for the trials.
3b. It was further recommended that Greenland develop objective descriptions of hunting methods, equipment and how efficient these are in small cetacean hunting, considering regional variations.		EGM-2011. Manual SW developed based on the EGM report and hunters comments. Manual distributed in hard copy to all hunters of small cetaceans and available online on Greenland's Governments webpage and NAMMCO.			CHM 01.2007**:** this would encompass an extensive study and therefore more suitable as a topic for a Master's thesis, encouraged NAMMCO to work towards finding the necessary funding. EGM-2011 and Manual SW.
3c. Greenlandic hunters had started developing a new handheld harpoon to improve the efficiency of beluga, narwhal, walrus and seal hunting. The Workshop views this as a positive initiative and recommends that Greenland continue to support this project.		In 2003 the new handheld harpoon (the steel lance) had been developed and could be ordered for production at the shipyards in Greenland. (NAMMCO AR 2002, p. 64). EGM-2011 and the Manual SW describes the improvements the hunters have experienced with the iron harpoon.			

WS-1999				
	4. Baleen whale hunting			
	4a. A Norwegian hunter initiated the development of a new whale harpoon that can be adjusted for each individual harpoon canon. The Workshop recommends that Norway continues to support this project.		The harpoon was qualified through shooting trials set up by ballistic experts and approved for hunting in 1999.	
	4b. Concern that Greenland hunts minke whales using rifles and handheld harpoons as the only weapons. An in-depth discussion revealed significant disagreement. (WS- 1999. page 12). The Workshop recommends that this hunting method be subject to a critical analysis and an objective description of methods and equipment, with the goal of determining necessary adjustments.	Analysis of TTD and S/L rates for the different hunting methods have been presented to the IWC. Detailed analyses of S/L rates have been presented to the WS 2006 , and TTD to the EGMs (2010 and 2015). Improvements in data reporting and hunting efficiency in both TTD and S/L rates were shown together with updated relevant legislation (EO No 12 of 16. July 2010 on Reporting from Hunting of Large Whales) based on the EGM recommendations. The legislation EO No. 10 of 13 April 2005 on Hunting of Large Whales with later amendments limits the collective hunt of minke whale to areas where boats with harpoon canon cannot cover the local need of whale meat. The Riffle hunt is limited to minke whales and is the only available hunting method in East Greenland and North Greenland.		EGMs on TTD for large whales (2010 and 2015).
	4c. The Workshop recommends that Greenland continue to work towards the goal of using the harpoon grenade in all hunts for baleen whales. It is, however, a source of concern that the penthrite harpoon grenade is so costly in Greenland that many hunters cannot afford to use it. The Workshop recommends that Greenland initiate an enquiry into the reasons for the price policies and work towards a price change.	From 2005 the price to the distributors in Greenland and Norway is the same in both countries. The Greenland Home Rule supports hunters with a 40-50 % subside in the purchase of harpoon grenades.		

	4d. Greenland has carried out a number of improvements on weapons and equipment used in whale hunting with the harpoon canon. In addition, the hunting regulations for large whales have been developed and improved. The Workshop notes with approval that Greenland has made these improvements and recommends the work to be continued in the future.		The last EO that was approved was No. 12 of 22. December 2014 (replacing No. 10 of 13 April 2005, replacing No. 10 of 17 April 2009, replacing No 11 16 July 2010) on Protection and Hunting of large whales. Courses on the handling and use of harpoon grenades are given regularly. A new course on the mounting and maintenance of harpoon guns was held in Nuuk in November 2006. Visit to the mechanical tool-shop making the grenade and canon took place in 2015 for having a direct connection between the company and the relevant authority in Greenland and getting a thorough introduction to the involved people. This was followed up by making an introduction video together with the company on the Whale Grenade-99 to be used in the courses for the hunters.			
	4e. Hunters were not able to buy the ammunition determined by experts to be the most efficient for killing whales, because it was not available in Greenland. The Workshop finds it questionable that market considerations have higher priority than professional judgement and justification and recommends that Greenland investigate the situation.		It is difficult to know which market considerations need to be investigated because it has not been established which ammunition is ideal in terms of efficiency; cost and associated rates of struck and lost (see recommendation 3a above).			
	5. The Workshop notes with approval that the Greenlandic Parliament has decided to formulate an animal protection law, and in this manner create an authoritative body that can introduce the element of animal protection in hunting regulations.		Both the Home Rule Act No. 25 of 18 December 2003 on Animal Welfare, and the Home Rule Act No. 29 of 18 December 2003 on Nature Protection have been approved.			
	6. In conclusion the Workshop agreed that the meeting had been valuable, in professional terms, and that it was desirable to plan a similar meeting in the future, but with a focus on particular hunting methods.					The NAMMCO Council endorsed the recommendation (NAMMCO AR 2000, p.27) and by 2007 three related Workshops have been organised by the CHM.

WORKSHOP-2001						NAMMCO AR 2000, 5.1.3, p 27 Council agreed to proposal from CHM to hold WS on ammunition and ballistics WS-2001. NAMMCO AR 2001, item 5, p. 26 Council endorsed all recommendations from WS-2001.
WS-2001	**1.** The target groups for the Workshop were hunters, administrators and scientists. The Workshop strongly emphasised the usefulness the hunters' knowledge and experience for the conclusions drawn at the meeting. The Workshop recommends that the hunters' knowledge and experience are utilised in future workshops.		The Government of Greenland covers the price of the participation of Greenlandic hunters, to make sure that they are able to participate from different regions of Greenland.			The recommendation to include hunter's knowledge and experience has been followed-up in all Workshops organised under the CHM.
	2. The Workshop acknowledged the work on upgrading, maintenance and standardisation of the harpoon canons and other whale hunting equipment in Greenland in the past years, and of the continued follow-up efforts, including the establishment of a permanent control system. This work has resulted in considerable improvements in personnel safety and has also increased the efficiency in the killing of fin- and minke whales. The Workshop acknowledged the major economic costs that are associated with this work.		A new course on the mounting and maintenance of harpoon guns was held in Nuuk in November 2006. Personnel from the main boat yards of West Greenland were trained. See also recommendation 4d WS-1999.			
	3. The Workshop referred to the follow-up work of the Faroe Islands with respect to shooting tests of different weapons and ammunition types on dead pilot whales. This information was very useful and can be utilised in standardising methods for similar studies on other species. The Workshop recommended that NAMMCO encourage the member countries to undertake more controlled and standardised studies on other species, and if necessary during ordinary hunting activities. The Workshop advised the NAMMCO Committee on Hunting Methods to develop guidelines for such studies and to make recommendations for target species.	Years 1999/2000 testing of blunt hook and beginning to develop what later became the spinal lance.				Implemented. "Shooting trials on heads of dead pilot whales – Guidelines to test the efficiency of rifle ammunition used for hunting and euthanasia of small whales" by Olsen and Øen was presented to the NAMMCO Council at its annual meeting in March 2006 (NAMMCO AR 2005, p.30).
	4. The presentations and discussions under the weapons and ammunitions theme indicated a great variation, between the member countries, with respect to the requirements for weapons and ammunitions used in hunting adult seals. The Workshop regarded it as beneficial to investigate the possibilities for harmonising the weapons and ammunition types for each species, with due considerations to the variations in hunting conditions in the NAMMCO member countries. In this regard it would be important to utilise the experience held by the hunters, and the Workshop urged that necessary studies be undertaken in order to support the harmonisation scientifically.		Greenlandic legislation on sealing EO No. 16 of 12. November 2010 on protection and hunting of seals is based on the paragraphs on methods on EGM-2009 and CHM recommendations.			The WS-2004 was organised as a follow-up of this recommendation.

	5. At the previous workshop on hunting methods in Nuuk in 1999, it was noted that the ammunition determined by experts to be the most efficient, was not always available in the stores. This remains a problem in several of the NAMMCO member countries. The Workshop repeated that it is questionable that market considerations still have higher priority than scientific and professional judgement and considerations.		See comment in the section related to WS-1999, 3a and 4e.			
	6. Results from Norwegian studies on rifles used as secondary weapons in the minke whale hunt were presented at the Workshop. These results showed that full metal jacket, round nosed ammunition from calibre 9.3 mm and larger, was very efficient for killing minke whales with a shot to the brain. The Workshop recommended that when weapons are replaced this is taken into consideration.		In Greenlandic legislation, caliber .30.06 has been set as the minimum calibre for a secondary weapon in the minke whale hunt.	In Iceland full metal jacket, round nose ammune from calibre 11,6 mm has been set as the minimum calibre for a secondary weapon in the minke whale hunt from, included in regulation on whale hunting no. 163/1973, with subsequent amendments.	In Norway calibre 9.3 mm has been set as the minimum calibre in the minke whale hunt from 1993. (Regulation 31 March 2000 on the conduct of minke whaling).	
	7. The Workshop referred to the "Report of the NAMMCO Workshop on Hunting Methods, February 1999" and recommended that the recommendations from that Workshop not yet considered must be followed-up.					Done (NAMMCO AR 2006, p 21)
	8. The Workshop acknowledged that the introduction of the new whale grenade has resulted in greater security for the hunters and has also increased the whale killing efficiency. The Workshop further emphasised the importance of including both the hunters' safety and the animal welfare aspects in official hunting regulations, including those pertaining to hunting methods.		These aspects have been incorporated in the EO No. 10 of 13 April 2005 on Hunting of Large Whales, later replaced by EO No. 12 of 22. December 2014 on protection and hunting of large whales. Furthermore it is the background for the Manual LW.	Hunter safety and animal welfare issues are included in regulation on whale hunting no. 163/1973, with subsequent amendments. Introduction to these issues and regulation are included in mandatory seminars for minke whale hunters.	Incorporated in the mandatory courses given to hunters.	

WORKSHOP 2004 - on Seals and Walrus						NAMMCO 2001, item 5, p. 26, Council agreed to recommendation from CHM to organise a WS on seal and walrus WS-2004. NAMMCO AR 2004, item 5.2 p. 33 Council endorsed the recommendations from the WS-2004.
	Hunter training					
	The Workshop recognised the continuing importance of hunter training for the improvement of hunter safety, reducing unnecessary suffering to animals, minimising struck and lost animals, maximising utilisation of the harvest, and equipment selection, manufacture and maintenance. Hunter training should be a priority for all hunts.		This is the background for the Manual LW and the Manual SW. There are no required training courses on how to shoot or where to aim at the animal in Greenland. Knowledge is passed on from generation to generation and between captain and crew. Manuals sent out to all hunters reporting a catch of a small cetaceans for the last five years. (CHM Doc-01-2018). The manual is also sent out to all whaling captains.		Sealers must participate in a biannual mandatory course which includes written tests. Captain and inspectors have an obligation to participate annually in these courses. The shooters must take a shooting test annually prior to the hunt.	
	• The Workshop recommended training for inexperienced hunters in particular and that such training should be a continuous process for all hunters in general.					
	• The Workshop recommended that information is provided to hunters on new and improved equipment that is presently available.					
	Struck and Lost Estimates					
	Workshop presentations and discussions demonstrated a lack of accurate and reliable estimates of "struck and lost" (S/L) for seal and walrus hunts. The Workshop recognised that reliable estimates of S/L are urgently required to allow better conservation and management and enable us to target hunts where S/L can be reduced. It was also recognised that reducing S/L benefits hunters because of potential higher catches, less unnecessary suffering to animals and a better public image. Struck and loss estimates are a priority for open water seal and walrus hunts.				Prohibited to shoot seals in the water during sealing operations.	NAMMCO AR 2015, item 8.2, p. 18-20: to reduce S/L Council tasked CHM to look at underlying reasons for S/L. CHM 02.2016 began the work, and it is ongoing (2018). Elements investigated are: known rates in different hunts, description of different hunts to identify reasons for S/L, how to collect S/L data, how to calculate S/L rates, which hunts to priorities etc. CHM 01-2017: information sheet for web on factors reducing S/L finalised. Agreed that collection of S/L data for large whales was controlled and that the challenge was small whales and seals. CHM 01-2018: agreed to develop table with overview of S/L rates in the different regions and hunts as working tool. Agreed on the following prioritising for collecting of S&L endorsed by the member countries (NAMMCO AR 2017, item 5.1, p 10): • For Greenland, to collect S&L data on narwhal and beluga • For Iceland, to collect S&L data on harbour and grey seal • For Norway, to collect S&L data on harp seal
	• The Workshop recommended that studies of S/L should be done in cooperation between researchers and hunters.		An estimate of S/L on harp seals, based on questionnaire surveys was made for WS-2006.			
	• The Workshop recommended the methods, techniques and equipment to reduce S/L should be developed and applied at the local level to ensure that these are appropriate to local conditions.		In order to reduce S/L, EO No.20 of 27 October 2006 on the Protection and Hunting of Walrus requires that the animals should be harpooned before firing the final lethal shot. Furthermore interviews with hunters from different parts of Greenland have been made on walrus hunting, 2010-2015 and is taken into consideration of the advice from NAMMCO SC.			

WS-2004

Minimise Animal Suffering					
• The Workshop recommended that the hunters should make every effort to reduce unnecessary suffering by hunted animals, by minimising killing times and avoiding letting injured animals escape. Such efforts should have priority for all hunts.	EO No 100 of 5 July 2015 on pilot whale drive describes the requirement that considerations of animal welfare etc be taken before giving the go ahead for a drive.	All regulations pertaining to sealing and whaling have incorporated the principles of humane killing from the Act number 25 of 18 December 2003 on animal welfare in combination with other relevant Greenlandic legislation. In addition, regulations exist on technical requirements (winch, harpoon, use of back—up rifle etc.)	Animal welfare Act no. 55/2013. Included in regulation on whale hunting no. 163/1973, with subsequent amendments.	All regulations pertaining to sealing and whaling have incorporated the principles of animal welfare for the killing of animals, including requirements of competence, laid down in the Act of 19 June 2009 on Animal Welfare.	
Calibre and Bullets					
The Workshop recognised that there is a need to establish minimum requirements for firearms and ammunition for seal and walrus hunts. It was further recognised that specific recommendations on selection of calibre and bullet types for different species and hunts are difficult to make because little information is available. These observations and recommendations apply to all hunts.		Minimum requirement for ammunition when going sealing is regulated by law: EO No 16 of 12 November 2010 on protection and hunting of seals. EO No.20 of 27 October 2006 on the Protection and Hunting of Walrus.		Minimum requirements for weapons and ammunition are included in the regulations pertaining to the conduct of sealing.	
• The Workshop therefore recommended that objective studies on terminal ballistics of various calibre and bullet types in seal and walrus hunting are carried out. • It was recommended that these studies be done in cooperation with the hunters.		No plans for own studies but use what comes from the NAMMCO work through WS and Expert group.		Study on comparison of the efficiency of different rifle bullet types in harp seals is - ongoing.	
There is a need to consider what types of firearms and ammunition are presently available in remote communities and the Workshop urged the stores to make available the ammunition determined to be appropriate for the various hunts.		See comment in the section WS-1999, 3a and 4e and 5.			

	Full Utilisation					
	The Workshop agreed that the fullest possible utilisation benefits hunters because of more returns from the harvest, preservation of traditional skills and a better public image. This applies to all hunts. The Workshop recommended the following: •That all hunting should occur within safe conservation limits. •That all hunts should work towards the fullest possible utilisation of harvested animals. That new uses and markets for seal and walrus products should be pursued	Intentionally killed as nuisance animals around fish farms (CHM Doc 01-2018).	The Executive Order no.20 of 27 October 2006 on the Protection and Hunting of Walrus limits the hunt and establishes quotas, hunting areas and hunting seasons. A management plan based on the gradual reduction of quotas for the period 2007 – 2010 has been approved. These steps are necessary to achieve a hunt within safe conservation limits . Both of the EOs on seal and on walrus requires that all meat, skin, blubber and other usable parts are brought from the hunting place or destroyed. With respect to the sealing industry attempts are made to develop the marked possibilities, latest attempt by the Industry is the QR-label information initiative.	No quotas are set for the seal hunt. (CHM Doc-01-2018)	The quotas are set within safe conservation limits. It is not an optimal utilisation of harvested animals in Norway. With respect to the sealing industry attempts are made to develop the marked possibilities	
	Hunter Safety					
	The Workshop recognised that the safety of the hunters should be a priority in all hunts.					
	• The Workshop recommended that the safety of the hunters must be considered in any regulatory measures or technical innovations to equipment and techniques.		The incorporation of hunters safety is mandatory when considering new regulations and in the implementation of regulations regarding equipment and techniques.	Hunters safety is considered when regulations are revised and in the implementation of regulations regarding equipment and techniques.	The incorporation of hunter's safety is mandatory when considering new regulations and in the implementation of regulations regarding equipment and techniques.	
	In particular, the Workshop recommended special attention to: hearing loss due to noise and the need for ear protection, bullet ricochet endangering people and property and protective gear for extreme cold and harsh conditions.		This is not regulated legally but optional for the hunters. However, the use of this kind of protection gear is increased among the hunters.	Act on Working Environment, Health and Safety in Workplaces No. 46/1980.	This is not regulated legally but optional for the hunters. However, the use of this kind of protection gear is increased among the hunters.	

WORKSHOP 2006 - on Struck and Lost					NAMMCO AR 2004, item 5. p. 31 Council agreed to recommendation from CHM to hold WS on struck and lost WS-2006. NAMMCO AR 2006, item 6.1, p. 21-2 Council endorsed all recommendations from WS-2006.
1. General recommendations WS Struck and lost					
1.1 Minimise animal suffering					
The Workshop recommended that the hunters should make every effort to reduce unnecessary suffering by hunted animals, by minimizing killing times to the extent that is feasible. However, this must be balanced by consideration of the safety of the hunter, and the risk of losing the animal.	Included in law and regulations.	Included in relevant Greenlandic legislation and regulations and also in text on the species specific licenses. (Species specific EO, Home Rule Act No. 25 of 18 December 2003 on Animal Welfare, and the Home Rule Act No. 29 of 18 December 2003 on Nature Protection)	Animal welfare Act no. 55/2013. Included in regulation on whale hunting no. 163/1973, with subsequent amendments.	All regulations pertaining to sealing and whaling have incorporated the principles of animal welfare for the killing of animals laid down in the Act of 19 June 2009 on Animal Welfare. In addition, regulations exist on technical requirements for whaling and sealing (winch, harpoon, use of back—up rifle etc, rifle calibre, ammunition, secondary weapons etc).	
1.2 Monitoring					
The Workshop noted that the present information on struck and lost is outdated or inadequate for several species and areas, and that accurate estimation of struck and lost is important for effective management and essential to improve hunting practices. The Workshop recommended that new monitoring programmes that are appropriate for local conditions should be developed that could produce accurate information that will be accepted by hunters and managers. Such monitoring programmes should be developed in full cooperation among hunters, managers and researchers.		All marine mammals under a quota system based on the species specific EO has mandatory S/L reporting system in place. The self-reporting system Piniarneq has since 2013 had the possibility of reporting S/L for any species when reporting online, hereby including all seal species and cetaceans. Further improvement for validating the data reporting is constantly developed. Any one wishing to hunt in Greenland is required to obtain a hunting lincense and report all catches incl. struck and lost animals, the database Piniarneq has data from 1993 and onwards.			See Council/CHL comment under WS-2004 S/L recommendation. CHM 01-2017: CHM concurred with the SC conclusion that the best method for collecting S/L data was using observers in the different types hunts, as S/L rates vary between species and hunts. Like the SC, CHM acknowledged that this would be logistically challenging and costly and would therefore perhaps not represent a prioritised parameter for improving assessments.
1.3 Proper training of hunters					
The Workshop recommended that hunters should be trained in both the theoretical and practical aspects of hunting, and that training materials and programmes should be appropriate to local conditions.	Manual PW. New legislation was introduced in 2015 obliging hunters to follow an accredited course in pilot whaling to be entitled to kill whales. The course includes a review of the Manual PW. (CHM Doc 01-2018)	See comment WS-2004 - hunters training. Manual LW and SW.	Manual LW.	Sealers must participate in a biannual mandatory course which includes written tests. Captain and inspectors have an obligation to participate annually in these courses. The shooters must take a shooting test annually prior to the hunt. New whalers have to attend a mandatory theoretical couse and a written test. The shooters must take a shooting test annually prior to the hunt, this applies both for the canon and the back-op rifle. Maunal LW are forwarded to all whalers, and can be found on the NAMMCO website.	Manuals LW, SW, PL accessable on the website.

1.4 Hunting equipment					
The Workshop recommended that hunters should always carry weapons and equipment appropriate to the target species and local hunting conditions, and that the equipment should be properly maintained and renewed when necessary.		Relevant species specific Greenlandic legislation specifies the relevant weapon and equipment, often based on NAMMCO recommendations.		The use and maintenance of adequate weapons for the killing of animals is laid down in Act of 19 June 2009 No 97 - Animal Welfare.	
1.5 Cooperative management					
The Workshop recommended that the hunters should be involved in the marine mammal management process, including the development of regulations pertaining to hunting. The Workshop furthermore recommended that the design, development and testing of new weapons and hunting equipment should be done in cooperation with hunters.		As part of the democratic hearing process all citizens in Greenland including the hunter's organisation KNAPK will have access to and be included in new drafting of legislation and can submit comments or suggestions of revisions.			
1.6 Sharing of technology and knowledge					
The Workshop recommended that there should be open exchange and sharing of information about new weapons, equipment and hunting techniques, and that this should be done on both the national and international levels.					All reports from WS and WGMs are public and on the website. Furthermore these have been presented to hunters and their associations in NAMMCO countires and elsewhere.
1.7 Hunter Safety					
The Workshop recognised that the safety of the hunters should be a priority in all hunts.		See comment under WS-2004 on Hunter Safety	See comment under WS-2004 on Hunter Safety	See comment under WS-2004 on Hunter Safety	Laid down in the ToR for CHM.
The Workshop recommended that the safety of the hunters must be considered in any regulatory measures or technical innovations to equipment and techniques.					
In particular the Workshop recommended special attention to: hearing loss due to noise and the need for ear protection, bullet ricochet endangering people and property and protective gear for extreme cold and harsh conditions.					
2.1 Seals	Intentionally killed as nuisance animals around fish farms (CHM Doc 01-2018).				
2.1.1 Hunter training					
• Develop suitable training materials for each area and hunt. These could use various media, *e.g* . audiovisual presentations on DVD or broadcast locally; written materials, and internet sites.	No specific training. According to the weapon legislation, completion of a firearms training course and possession of a firearms license are required to be entitled to handle weapons. (CHM Doc 01-2018)	A school for hunting and fishing was established in 2008 in North Greenland. Furthermore several boarding schools have as part of the curriculum hunting and fishing as a course.	There are no regulatory training courses on how to shoot or where to aim at the animal in Iceland, though a normal firearms license must be attained. (CHM Doc 01-2018)	Mandatory training course prior to hunting season. For the coastal hunt the hunter must pass an annual shooting test. (CHM Doc-01-2018)	
• In areas where hunting is practiced, courses in hunting should be available in the school curriculum. This is already the practice in some areas, *e.g* . Finland. A comprehensive and advanced hunting education programme is under development in Greenland. In Norway it is mandatory to undertake a training course set up by the authorities before going hunting.					

2.1.2 Techniques and equipment	No specific legislation pertaining hunting, but permission was granted to kill seals with rifles of minimum calibre 6.5 mm using hollow pointed bullets. (CHM Doc 01-2018)				
• The type of equipment that is suitable depends on the area, species, season and local environment. Descriptions of suitable equipment for each situation should be developed by local authorities, and made available to hunters and educational institutions.		EO No 16 of 12 November 2010 on protection and hunting of seals.	Harbour seal pups hunted by netting. The seal pups are then clubbed and subsequently bled. Grey seal pups are killed on land either a seal club or by shooting. Adult grey seals hunted using calibre rifles (.222 -243 calibre). Culling around fish farms: adult harbour seals are killed in the river mouth, and the method used is shooting, usually by .22 calibre rifles. (CHM Doc 01-2018)	The weapon requirements are generally laid down in the Act 19 June 2009 on Animal Welfare, and are detailed in the regulations on the conduct of sealing in the West Ice and East Ice, on coastal seal hunt, and on minke whaling.	
• Hunters should always have suitable equipment, in good working order, readily available when hunting.					
• In situations when seals usually sink after death, it may be advisable to use small-calibre weapons and shoot to injure, not to kill. The injured seal can then be secured using a hook or harpoon, and then killed. This technique is effective in reducing struck and lost, but does likely result in greater animal suffering.					
2.1.3 Regulatory measures					
• In some areas it may be advisable to stipulate the minimum equipment that must be at hand when hunting. This is already done in most areas.		EO No 16 of 12 November 2010 on protection and hunting of seals.	Hunters are required by law to collect the culled animals, and it´s forbidden to leave the carcass in the water. Recent animal welfare laws in Iceland forbid drowning as a killing method of animals, which means that the nets need to be monitored regularly to avoid that the pups drown. (CHM Doc 01-2018)	See above point 2.1.2.	
• In some areas, seasonal closures could be used to forbid hunting in seasons when seals usually sink after death. Such closures are used in Norway and Finland, but may not be suitable in areas where hunters must take seals year-round.					

2.1.4 Monitoring					
Independent observers and governmental inspectors have been effective in monitoring hunts for harp and hooded seals in Canada and Norway. However, it is not possible to use independent observers to monitor all seal hunts. The following alternatives were recommended:	Fish farms are obliged to report the number of seals that are shot to the Ministry of Fisheries. According to the weapon legislation, completion of a firearms training course and possession of a firearms license are required to be entitled to handle weapons. (CHM Doc 01-2018)	The self-reporting system Piniarneq has since 2013 had the possibility of reporting S/L for any species when reporting online. Further improvement for validating the data reporting is constantly developed. (See under 1.2 for further information on catch reporting systems)	Hunters are not required to report their catches. Hunt statistics are collected by MFRI by direct contact with the hunters. (CHM Doc 01-2018)	National veterinary inspectors have been present on every sealing vessels (pack-ice hunt) since the late 1980-ies. Self-reporting of catches in the coastal hunt. There is no mandatory reporting of TTD or IDR for either of the two hunts. (CHM Doc-01-2018)	
• Self-reporting systems such as *Pinniarneq* in Greenland could possibly be modified to provide information on struck and lost;					
• In other areas, community-based monitoring using post-hunt interviews, as used in Chukotka, may be effective;					
• A programme using "index" hunters, trained and contracted to provide information on their hunting activities, which is later extrapolated to the entire hunt, may be effective in some situations.					
2.2 Large whales					
2.2.1 Hunters training					
• To encourage training, in practice and in theory with: experienced hunters, experts on weapons and experts on anatomy;		Manual LW. An exchange of experience and knowledge incl anatomical charts, between whalers from Alaska and Greenland was organised through many meetings and a visit to Barrow, Alaska before the start to hunt the bowhead whale in Greenland. As part of the reporting explanations has to be given in case of S/L or TTD above 30 minutes. The authorities will contact hunters for further information in such cases.	Manual LW.	See above point 1.3.	Manual LW.
• To produce educational material, including anatomical charts designed for whaling;					
• In order to learn and improve, feedback to whalers should be improved, including feedback on: successful kills, problematic kills, cases of struck and lost and their causes.					
2.2.2 Techniques and equipment					
• To ensure that adequate equipment for securing and killing is well maintained, functioning and at hand;		EO No 12 of 16 July 2010 on reporting from hunting and strike of large whales. EO No 12 of 22. December 2014 on protection and hunting of large whales describe prescribed equipment. Manual LW. EGMs in 2010 and 2015.	Regulation No 163, May 30, 1973 on whaling with recent ammendments describe prescribed equipment.	See above point 2.1.2	
• Time to death should be as short as possible, once the whale has been effectively secured;					
• In order to prevent whales sinking when using harpoon gun, it is recommended to:					
1) Cause instantaneous death					
2) Keep the back-up rifle at hand					
3) Keep harpoon and attachment points well maintained					
4) Use forerunners of adequate strength					
5) Replace forerunners at regular intervals					
6) Keep a back-up forerunner ready					
7) Use the air pump to inflate the whale where legally feasible	NA			Not permitted in Norway.	
8) Use grappling irons to secure the carcase.				NA - all whales are winched on board the vessels.	

• To improve the Norwegian penthrite grenade used for hunting fin whales in Iceland and in Greenland, in order to increase the rates of instantaneous death or unconsciousness.		Improvement of the penthrite grenade (Whale grenade-99) for use on large whales in Greenland has been done, resulting in a modified grenade, 2010.	Improvement of penthrite grenade (Whale grenade-99) for use on fin whales in Iceland has been done.	NA	
• To facilitate access to good weather forecasting for whalers working from small boats;					
• To avoid killing the whale before it has been secured sufficiently. This is especially true when using small boats to hunt whales that may sink.					
• To develop a gun to deploy harpoons attached to floats. This would shorten the time needed to secure whales that may sink when hunting from boats without a harpoon cannon.					
2.2.3 Regulatory measures					
• To strengthen international cooperation in order to facilitate: a) access to information and technology and b) purchase and transport of equipment, including weapons and explosives.		Visit to mechanical tool-shop in 2015. EGMs in 2010 and 2015. See comment 1.2 above.			All WS are open for all and are based upon sharing of information on methods and equipment.
• Development and implementation of ways to reduce struck and lost should be done in close collaboration with the whalers.			S/L animals are reported by the whalers to the Directorate of Fisheries.	S/L animals are reported by the whalers to the Directorate of Fisheries.	CHM 03-2016: CHM agreed to advice Iceland and Norway to address their hunters with the aim of finding out why the harpoon line breaks.
2.2.4 Monitoring					
• Reporting of the causes of struck and lost is needed to provide feedback to whalers.		EGMs in 2010 and 2015			CHM 03-2016: CHM agreed to advice Iceland and Norway to address their hunters with the aim of finding out why the harpoon line breaks. CHM02-2018: line in propel caused by direction of boat and whale. Occurs rarely and no obvious actions to prevent it.
2.3 Small whales			NA	NA	
2.3.1 Hunter training					
• Training is paramount – it should be community based and species specific. Local experienced hunters who are familiar with local environment should be employed to train.	Manual PW.	See comment WS-2004, hunters training. Manual SW.			
• Traditional knowledge should be taught in high schools.		See comment provided under 2.1.1.			
• Ways have to be found to counteract the negative effects of diminishing quotas and hunting restrictions on the acquisition of hunter skills in future generations.		See comment under 2.1.1 above and WS 2004 Hunters training.			
2.3.2 Techniques and equipment					
• Using more efficient equipment still does not necessarily diminish struck and lost. Thus, a combination of suitable equipment and training is needed in the use of rifles and appropriate ammunition.		EO No 1 of 15 January 2016 on protection and hunting of beluga and narwhal describe prescribed equipment. Manual SW. EGM 2011.			
• Methods of improving access to long-range forecasting of weather conditions need to be found as weather is a very important factor in affecting struck and lost.	NA				

• Develop a weapon that could improve the range of strike, e.g. an air gun that could be modified to incorporate firing of a harpoon head. This could improve the firing / strike range and the securing of the whale.			Manual SW.

• In hunting communities, suitable ammunition designed for marine mammals should be made more readily available.		See comments WS 1999, 3a and 4e and 5.	NA	NA	
• Use of high velocity rifles can result in hearing loss and steps should be taken to minimise this problem and disseminate technical information for user safety.		See comment WS 2004 - Hunter safety.			
2.3.3 Regulatory measures					
• The users (hunters) should be involved in decision-making processes concerning the hunt such as the planning of hunting quotas and in the areas of operation. User knowledge should be used in management in conjunction with science.		See comment under 1.5 above.			
• Establishing formal meetings with local government officials on all aspects of hunting - equipment, safety, training, etc. where reduction of struck and lost can also be discussed. These meetings could establish local hunting rules and regulations, the required equipment, etc. that would help to mitigate struck and lost.		Next round of meetings planned end of 2018. Previous meetings took place in different parts of Greenland, approximate every second to third year. CHM 02-2018: no new information.			
2.3.4 Monitoring					
• All parties (hunters, administrators, managers, biologists) have to get together to find a way forward on the matter of recording and reporting stuck and lost. One route could be to establish local sub-committees to work out an acceptable and appropriate monitoring system in hunting areas.					See WS-2004 - struck and lost estimates, WS-2006, recommendation 1.2.
2.4 Walrus	NA	EO No 20 of 27 October 2006 on protection and hunting of walrus.	NA	NA	
2.4.1 Hunter training					
• Walrus hunters should be properly trained and their training should be appropriate for the local environment. Such training can occur through traditional methods, formal schooling and other media such as video and the internet. It was specifically emphasized that inexperienced hunters should accompany experienced hunters on hunts.					
2.4.2 Hunting techniques					
• When hunting walrus on ice floes, the hunter should approach as closely as possible before shooting. The hunter should shoot animals in the centre of the group first so that killed animals won't be pushed into the water by the others.					
• In open water hunts, it is best to harpoon before shooting, but this is not always feasible. It may be necessary to shoot the walrus in the body and lungs to disable it so that it can be harpooned, and then shoot it lethally. This will reduce the incidence of struck and lost and the chance of the walrus attacking the hunter.		Before the killing shot is delivered against the walrus, it must be harpooned. The harpun used must be attached to one or more buoys so that catch loss is avoided.			
Hunters should obtain the best available forecasts before setting out, only initiate hunting if the weather conditions are right, and abandon hunting if the weather deteriorates.					

	2.4.3 Hunting equipment					
	• Hunting equipment is often specific to particular regions and seasons, and is adapted to local conditions. Local authorities should compile descriptions of equipment suitable for each area and make these available to hunters and teachers.		Catch of walrus must be done using a rifle with a minimum calibre 30.06 (7.62 mm). Only pointed bullets (full metal jacket) is allowed. The use of automatic and semi-automatic rifles is not permitted.			
	• Hunters should ensure that proper equipment is available and well maintained.					
	• Technological innovation could reduce the incidence of struck and lost in some hunts. A harpoon gun that would be effective at a range of 10-15 m would be particularly effective in walrus hunting.					
	2.4.4 Monitoring					
	• The importance of monitoring must be explained to hunters so that they can "buy in" to a monitoring programme.		The self-reporting system Piniarneq has since 2013 had the possibility of reporting S/L for any species when reporting online. Further improvement for validating the data reporting is constantly developed. (See under 1.2 for further information on catch reporting systems)			
	• A monitoring system should provide feedback to hunters so that they can improve their hunting techniques.					
	• Community-based monitoring, based on a combination of hunt observation and post-hunt interviews, has been effective in Chukotka and could be adapted to other areas.					
	• A system based on "index hunters" may be effective in some areas.					

EXPERT GROUP MEETING 2009 - on Best Practices in Hunting and Killing of Seals

Organised on request from Council (NAMMCO AR 2007-2008, page 20). NAMMCO AR 2009, item 7.2, p. 20 Council endorsed all recommendations EGM 2009.

Firearms					
Firearms and ammunitions used should have the capacity to achieve the intended effect. Noting that new types of ammunition have been developed for hunting, the EGM recommends further studies on the use of ammunition for hunting seals of different species and age groups in order to determine their capacity to achieve the intended effect		EO No 16 of 12 November 2010 on protection and hunting of seals covers all recommendations from the EGM-2009. Interviews with hunters from different areas has been undertaken and used in the legislation.		Studies on ammunition for hunting seals in the Norwegian harp seal hunt are ongoing.	
Hakapik and club	NA	NA	NA	The proper use of the hakapik is gone through in detail during the course for seal hunters. It is mandatory to practice on the use of the hakapik prior to the hunt, under the supervision of the inspector.	
When using the blunt projection of the hakapik the hunter's relative position to the animal is less important than a stable platform.					
When using the spike of the hakapik it is recommended that the hunter is positioned behind the seal in order to achieve maximum effect. The intended effect of the curved spike is to penetrate and damage the deep parts of the brain (including the brainstem) in order to achieve irreversible damage to these vital areas.					
The use of the hakapik and clubs on seals in water should only occur when the primary tool has not rendered the animal unconscious.					
Different types of hakapiks and clubs are used and known to be effective tools to stun young seals. Factual information is required to explain the effectiveness of hakapiks and clubs as stunning tools, through evaluation of the force delivered in relation to the damage produced and the relative solidity of the skull, which may vary among species.					
Bleeding out	Description no recommendations.				
The EGM discussed different processes of bleeding out seals, and its significance in relation to the criteria for death.					
Legislation pertaining to some large scale seal hunts requires bleeding as soon as possible after stunning/killing.					
The EGM recognises that bleeding is a precautionary measure to ensure death in all animals.					

Recommendations					
The EGM recognises the value of determining the duration (average and range) of bleeding in seals when axillary (brachial) blood vessels on both sides are cut, which represents the bleeding method currently and commonly used. This information should be available for different species as differences may exist. Other bleeding methods (e.g. carotid arteries and jugular veins) could also be investigated.				Studies on the duration of bleeding in harp seals when axillary arteries on both sides are cut, are ongoing.	
Combination of methods used for stunning and killing of seals					
Canadian and Norwegian legislations both prescribe a three-step process for killing in their large scale hunts of seals.	Only description of existing hunting methods - no recommendations.				
In both countries firearms are the main primary tool to stun/kill seals in the large scale hunt. In both hunts the hakapik/club used as primary tool can only be used to stun/kill young seals (less than 1 year) and shooting in the brain/neck with firearms is the mandatory primary method for all seals older than 1 year (1+ year).					
In the Norwegian large scale hunt when using the hakapik as primary tool, the young seal shall first be struck with the blunt part of the hakapik (step 1), then immediately after be struck with the spike of the hakapik (step 2) so that it penetrates deeply into the brain before the seal is bled (step 3). When the firearm is used as primary tool the seal is shot (step 1) and immediately reshot if necessary, then struck in the brain with the spike of the hakapik as soon as possible (step 2) and then bled (step 3).					
In the Canadian large scale hunt Step 1 is the same as in the Norwegian hunt when the hakapik/club is used as primary tool. However, step 2 differs as it requires that the sealer immediately checks by palpation the cranium of the animal (step 2) to confirm that it is completely crushed by the primary tool before bleeding out for a period of one minute (step 3) as soon as possible after step 2. When the seal is shot (step 1) the sealer must observe the seal for directed movements and shoot the seal again if necessary, check by palpation the cranium of the animal (step 2) as soon as possible after step 1, and then bleed out for a period of one minute (step 3) as soon as possible after step 2.					
Conclusion					
The EGM recognises the value of a three-step killing process in large scale seal hunts.					

	Training and education					
	The EGM wishes to emphasis the fundamental importance of information, education and training for seal hunters and inspectors in order to carry out the hunt in an appropriate manner with respect to animal welfare. Important elements of such education could include: animal behaviour, anatomy, physiology, ballistics, ethics, legislation, handling of carcass, etc				Included in mandatory courses held prior to pack-ice sealing.	

EXPERT GROUP MEETING 2010 - 1st Assessment of TTD in large whales

The 1st TTS EGM-2010 was in response to a proposal from CHM to Council (NAMMCO AR 2009, p. 20).

	Norway	NA	NA			
	Data have not been sampled in the last 8 years. The EGM recommended a sampling of Time to Death (TTD) in the same way as was done in previous years so that the data are comparable – either on all boats or in a random sample of boats				TTD data collection carried out 2011 and 2012, results assessed at the 2nd EG meeting in 2015.	
	Iceland					
	Minke whale					
	The EGM recommended that in the future, Iceland reports for minke whales whether the whales are killed instantaneously and if not, the TTD.			Implementation of reporting followed up. TTD collection carried out 2014, 2015 and 2017, preliminay results assessed at the EGM-2015.		
	Fin whale					
	The EGM recommended that in the coming season, data of killing efficiency - TTD and Instantaneous Death Rate (IDR) should be collected and analyzed with covariates (estimated distance and angle of harpoon gun shot, hit region and detonation area) for the sake of improving hunting methods.		NA	TTD collection carried out in 2014, results assessed in EGM-2015. TTD estimated by necropsy reports from 2014.		
	It was noted that a development programme for the fin whale hunt has started in Iceland. In 2010 the second prototype of a new penthrite grenade designed for the fin whale hunt with 90 mm harpoon guns will be tested. The EGM acknowledged the work and encouraged continuation and completion of this work.					
	The EGM furthermore encouraged the specialist examination of organs and tissues to better understand how the whales die.			Incorporated in the TTD work carried out in 2014		
	The EGM recommended an examination of the potential use of acoustic monitoring of grenade detonation in order to enhance human safety during flensing.			Acoustic monitoring of grenade detonation installed on all active hunting vessels.		

EGM-2010	**Greenland**				
	Minke whale - harpoon hunt				
	In Greenland and Iceland, TTD is estimated by the hunters but they have no necropsy reports to confirm TTD. In addition, the current IWC criteria used tend to overestimate TTD. The EGM recommended Greenland to present the data and analyses in a statistically more informative way than is being done now.		Recommended data analysis methods and presentation implemented from 2015 as a result of the NAMMCO seminar - see response column Council/CHM.		NAMMCO organised a seminar on statistics and analysis in 2016. Greenland and Iceland participated.
	It was furthermore recommended the organisation of a practical training course for gunners. There should, as stated by the hunters, be a debriefing at the end of the season in order to exchange information and experiences from the season.		Courses on the use and maintenance of the harpoon canon have been held. Organised practical training courses for gunners have not been held. Video of how the Whale Grenade-99 is put together was developed in 2016.		
	Minke whale - Rifle hunt		EO No 12 of 16 July 2010 on reporting from hunting and strike of large whales.		
	There is a risk of a longer TTD and higher "struck and lost" in the rifle hunt than in the grenade harpoon hunt.		Description no recommendations.	NA	
	The Greenlandic hunters stated that there is a clear difference in efficiency of killing between different geographical regions in Greenland.				
	The EGM recommended that experienced hunters should meet with less experienced hunters to exchange information. It is especially important to focus on where to aim the first shot and the aiming of the shot that kills the whale after the floats have been attached.		Meetings between hunters take place in a self-organised manner. NAMMCO manual on large whales.		
	More data are needed with reference to the body position where the whale is hit and TTD. Norwegian anatomical figures of the position of the brain of minke whales can be used for training purposes and be handed out to the hunters.		Reporting on strike location was implemented in EO No 12 of 16 July 2010 on reporting from hunting and strike of large whales. Manual LW.	NA	
	Fin whale				
	The EGM acknowledged the improvement of TTD in recent years in Greenland. This improvement is probably the result of increased hunter experience.		Description no recommendations.		
	Bowhead whale				
	The EGM recommended that shooting trials are set up to study the trajectory of the harpoon through the water and on this basis give advice on how to approach and where to aim at the whale.		Shooting trials following the NAMMCO directions was set up in 2010 and the hunters were advised on how to approach the whales and where to aim at the whale.		
	Fin whale and bowhead whale				
	The EGM agreed with Greenland's recommendation to increase the current penthrite charge for the fin and bowhead hunts and also to investigate a potential increase in the propellant charge.	NA	No changes in propellant charge, but work undertaken on the grenades explosive amount.		

Fin, humpback and bowhead whales				
The EGM recommended that the same modified penthrite grenade be used for the three large species – in fin, humpback and bowhead whale hunts.	CHM 2012. Shooting trials had been set up and the hunters had been advised on how to approach the whales and where to aim at the whale. A new grenade with 45 g of penthrite was introduced for the hunt of fin, bowhead and humpback whales in Greenland. Simultaneously the trigger rope was reduced from 110 cm to 90 cm which detonate the grenade at a depth of 110 cm.			
It was furthermore recommended that hunters be trained to measure and report on strike location, detonation location and distance between the two.	Difficult to get the information from hunters and wildlife officers– training started but data feedback minimal.			
Assessment and comparison of different hunts				
Minke Whale				
Processing of data:				
The EGM recommended collecting TTD for whales that do not die instantaneously. The purpose is to analyse the reasons for differences among different hunts in order to improve efficiency.	TTD data is part of the self-reporting mandatory information all whalers are required to report. It is collected in the same standardised way with reference to the body position where the whale is hit in relation to TTD both for the riffle and the harpoon. Data analysis work in progress not finalised, is resource depending.	Measurnments on TTD have been made for the minke whale hunt in Iceland by inspection during the hunt and post-mortem examination for the 2014, 2015, 2017 and 2018 seasons. In total 24 measurnments have been collected. Results have not yet been reported, due to few samples, but preliminary results are available.	This is already included in studies on minke whale killing efficiency.	
Information on IDR for all hunts is probably biased low and TTD is biased high and these biases are probably greatest for the Greenlandic hunt. This especially concern hunts where the TTD are estimated by the hunters and are not corrected by *post-mortem* examinations.	Description no recommendations.			

Education and training					
Regular training and exchanging of information is very important to achieve more efficient hunts and to improve animal welfare.	Manual LW is part of the training course for hunters on handing of the Whale grenade-99 and it is sent out to all whaling captains. Meetings with hunters from different regions to exchange information and discuss the EGM recommendations are under planning. Hunters locally hold debriefing meetings that is not organised by the Ministry.	Manual LW.	Manual LW.	Manual LW.
The EGM recommended that NAMMCO develop a handbook for hunters giving relevant information inter alia on weapons, killing techniques and animal welfare.				
The EGM emphasised the importance of combining theoretical education with physical meetings in order to exchange information and experiences, including sampling and recording of data.				
Monitoring				
Monitoring serves at least three important purposes: •Ensures that the hunt is carried out according to laws and regulations; •Provides information relevant for the management of the stocks; •Provides information on killing efficiency and animal welfare.	Description - no recommendations			NAMMCO Observation Scheme is a mechanism to oversee compliance to regulations. It does not give full coverage but never the less represents monitoring of the hunts that are being observed, at the time they are observed.
The EGM recommended standardizing the TTD criteria used across hunts. It was acknowledged that the hunters are doing the monitoring in addition to many other responsibilities – therefore a balance will have to be achieved between hunting activities and monitoring /collecting information.	TTD criteria same as the one used in IWC.	TTD criteria same as the one used in Norway.	TTD criteria same as the one used in Iceland.	
The EGM recommended that a small group be formed to prioritise the needed monitoring information.				NAMMCO AR 2015, page 20: The need to organise a workshop on alternative methods for collecting standardised TTD data that are less expensive, thus making it easier to compare TTD between countries. CHM discussions ongoing.

EXPERT GROUP MEETING 2011 - On small whale hunting					As a follow up from the EGM-2010 on a recommendation by CHM, Council endorsed to (NAMMCO AR 2010, p. 22): 1) Convene EGM-2011 on small whales, 2) Develop manuals for maintenance and use of weapons (finalised 2014).
Drive hunt - Faroe Islands		NA	NA	NA	
The EGM noted that the introduction of the spinal lance has entailed significant improvements in the TTD for the Faroese pilot whale hunt. The EGM also noted the extensive advances that had been made in the development of the lance.	Parliamentary Act No 56 of 19 May 2015 on pilot whales and other small whales, most recently amended by Parliamentary Act No 44 of 6 May 2016. Executive order No 100 of 5 July 2015 on pilot whale drive.	NA			
The EGM recommends:					
• An illustrated manual is developed to document the technique, gear and bays certified for drive hunts. A manual could add credibility to the science behind the improvements, facilitate uniform practice among bays and also assist in exporting the knowledge to other hunting communities.	Manual PW.				
• The spinal lance has proven efficient in reducing the TTD and reducing the number of cuts, and therefore the standardized lance should be made mandatory for use in the Faroese drive hunt.	Use of spinal lance and blowhole hook included in new regulation. See Drive hunt above.				
• Adopting this lance as a standard should not preclude further improvements of the lance.	Design of lance revised after 2015 season (CHM 01-2017).				
• Any damages from the use of the newly designed blunt tipped hook should be further explored.					
• TTD should be measured from the first use of the blunt hook.	TTD is measured from the first use of the blunt hook .				

EGM-2011

Hunting of pilot whales, dolphins and porpoises - Greenland	NA		NA	NA	
The EGM recommends that regulations on equipment and hunting methods are developed for harbour porpoises, white-sided and white-beaked dolphins, pilot whales and killer whales and that efficiency, struck and lost rate and TTD are documented for the involved species. It is recommended that data are gathered in a standardized manner making comparison between hunts and development over time possible.		It is mandatory to report any catch and S/L of small cetacean. Drafting of regulation in the form of a species specific executive order is in progress. TTD will be collected in the same standardised way as for the large whales with reference to the body position where the whale is hit in relation to TTD both for the riffle and the harpoon. S/L animals are mandatory to report and possible to report the through an online self-reporting system since 2013 (data goes into the database Piniarneq)			
Hunting of beluga and narwhal - Greenland					
The EGM appreciates Greenland's effort to improve the data collection on struck and lost and to initiate data collection on TTD. It is recommended that data are gathered in a standardized manner making comparison between hunts and development over time possible.		TTD is collected in the same standardised way as for the large whales with reference to the body position where the whale is hit in relation to TTD both for the riffle and the harpoon., S/L is mandatory to report and possible to report both through the special reporting (særmeldingsskema) and the online self-reporting			
Netting - Greenland					
The EGM noted that netting of beluga and narwhal is prohibited in most areas in Greenland, but is allowed in East Greenland and one location in North West Greenland. This method is used when there is no other available option. The EGM noted that netting is likely to cause stress for the animals associated with the capture and the prolonged time to death and recommends that every attempt should be made to develop alternative catching methods.		Resources economically and timewise have not been available given other priorities to collect data from the two area specific hunts in Greenland.			

	Hunter training					
	The EGM recommended that hunters should be trained in both the theoretical and practical aspects of hunting, and that training materials and programmes should be appropriate to local conditions.	Manual PW.	See comment WS-2004 - hunters training, WS-2006, 1.3 and 2.2.1			
	The EGM recommends the development of a training manual for hunters, to include such topics as hunters' safety, anatomy of the relevant species with emphasis on target sites likely to minimise TTD and S/L, required equipment, such as weapons, ammunition and secondary equipment, approaches to efficient utilisation of carcasses, and other topics to be identified. The EGM recommends a small working group be identified to explore the feasibility of developing such a manual, fully identify its components and develop a plan of human and other resources needed to produce it.		Manual SW sent out to all hunters who have reported catch of small cetacean the last 5 years – approx. 2 500 copies.			
	STRUCK AND LOST IN SMALL CETACEAN HUNTING	NA				
	The issue of struck and lost (S&L) was not on the agenda for the meeting but was raised at the beginning of the meeting. It was agreed to discuss the issue if time permitted. However due to lack of time the Expert Group recommended that Greenland and Canada in cooperation discuss the issue. The following statement was submitted for inclusion in this report from Greenland and Canada: •It was noted that Canada did not present new or recent information on rates of struck and loss of small cetaceans. •It was noted that Greenland reports a loss rate of 0 on a reported catch of 179 narwhals and 86 belugas. Canada and Greenland delegates agree that an exchange of information and experience on the collection of struck and loss rates in the harvesting of marine mammals would be beneficial to both the resource harvesters and the management decision process.		Some exchange of information is given through the joint JCNB meeting. Different trials have been undertaken on S&L issues: Information from hunters on scars observed on narwhal and beluga as a way of trying to establish a survival rate and not set S&L as a 100 % death rate. Limited data has been received. Instead of all S/L animals being subtracted from the quota and the licence is considered used, a trial is planned for walrus, where S/L reports do not result in quota reducing, and the license can be used for a new animal, when the S/L has been reported to the municipality. This is an approach to get an estimate of S/L rates in different part of Greenland. CHM 02_2018: requires a change in current EO - expected to come into force in early 2019.			

EXPERT GROUP MEETING 2015 - 2nd Assessment of TTD in large whales					Council (NAMMCO AR 2014, p. 15) tasked the CHM to 1) Convene EGM-2015 onlarge whale TTD, 2) Organise a seminar to focus on data collection, analysis and presentation.
Norway	NA				
The EGM acknowledges the completion of data gathering that has been done since 2010 and also the improvement in the quality of the hunt over the past few decades.				Next should be in 2022.	
The EGM recommends that Norway repeat monitoring of the hunt with regard to TTD and IDR at 10-year intervals unless important issues arise that require more frequent monitoring.					
Iceland					
Minke whale					
The EGM acknowledges the work that has been done since 2010. The EGM encourages Iceland to try again to gather data on TTD and IDR and increase the sample size in order to obtain more robust information. A sample size of 25-30 animals should be adequate to obtain statistically reliable data for some types of comparisons.		NA	Collection of TTD undertaken in 2014, 2015 and 2017. TTD have been collected for 19 animals. TTD will continue in 2018 with the aim to collect assessment of TTD for at least 25 animals, as sugged by EGM-2015.		
There has been no training course arranged since 2003. A new course for the hunters should be arranged.			Training course held 2016 – mostly theoretical as regulations does not require a practical shooting test before each season.		
Fin whale					
Recommendations from 2010 are fully completed and the EGM acknowledges this.					
The EGM recommends that Iceland repeat monitoring of the hunt with regard to TTD and IDR at 10-year intervals unless important issues arise that require more frequent monitoring.			Next should be in 2024		

EGM-2015

Greenland			
Minke whale - hapoon gun hunt			
There has been an improvement of the grenade hunt of minke whales. The EGM acknowledges this, and also the low struck and lost rate. The IDR is lower, and the TTD greater than in Norway, and the aim should be to improve the hunt efficiency. The recommendations from 2010 to present the data and analysis in a statistically more informative way will be fulfilled in the near future. Analysis of strike location should be informative of why Greenlandic hunts have lower IDR than Norwegian hunts and the EGM recommends that the result of this analysis be presented to hunters in future trainings.	Data analysis work in progress not finalised, is resource depending.		
It was furthermore recommended to organise a practical training course for gunners. There should, as stated by the hunters, be a debriefing at the end of the season in order to exchange information and experiences from the season.	No practical courses for gunners held. Hunters localy hold debriefing meetings that are not organised by the Ministry.		
Minke whale -rifle hunt			Council 2015 endorsed CHM concern that (NAMMCO AR 2015, p. 20) :
Data show that there is a longer TTD and higher struck and lost rate in the rifle hunt than in the harpoon hunt.	Description no recommendations.	NA	The rifle hunt in Greenland seems to be increasing, as a result of demand for meat that is not being met by the harpoon grenade hunt.
The EGM learned that the proportion of minke whales hunted in the collective hunt has been increasing in recent years as compared to the number of whales hunted with deck-mounted harpoon gun. Noting that rifle hunts are increasing, the EGM encourages Greenland to evaluate the current sequence of the use of rifle and harpoon to catch the animals and also the efficiency of the harpoon in this sequence. It also encourages review of other types of harpoons.	Resources economically and timewise have not been available given other priorities to collect data from the hunts in all of Greenland.		
The Greenlandic hunters stated that there is a clear difference in efficiency of killing between different geographical regions in Greenland. The EGM reiterates the recommendations that experienced hunters should meet with less experienced hunters to exchange information.	Meetings with hunters from different regions to exchange information and discuss the NAMMCO EG recommendations are under planning.		
The EGM acknowledges that Greenland has gathered data pertaining to the body position where the whale is hit and TTD, and looks forward to analysis and interpretation of these data to be made available.	The dataset awaits analysis depending on resources.		

Fin whale					
The EG acknowledges Greenland for the change in the charge of the grenade that has resulted in a higher IDR for the fin whale hunt. The IDR is lower and the TTD greater than in the Icelandic fin whale hunt and the aim should be to improve the efficiency bearing in mind the differences in equipment used.	The dataset awaits analysis depending on resources.				
Data are needed with reference to the body position where the whale is hit in relation to TTD, and the EGM looks forward to analysis and interpretation of these data to be made available.					
Bowhead					
The EGM acknowledges that shooting trials to study the trajectory of the harpoon through the water have been performed.	Very few whales caught (2018), so a limited dataset, that has not been analysed yet.				
Data are needed with reference to the body position where the whale is hit in relation to TTD, and the EGM looks forward to analysis and interpretation of these data to be made available.					
Fin, humpback and bowhead					
The EGM recommends that hunters be trained to measure and report on strike location, detonation location and distance between the two in order to evaluate the efficiency of the hunts.	Difficult to get the information from hunters and wildlife officers– training started but data feedback minimal.				
GENERAL				NAMMCO AR 2015, p. 20: Council endorsed CHM recommendations and tasked CHM to advice on how to best deal with:	
Accepting that struck and lost is an inevitable part of all whaling operations the EGM recommends that there be a review of the underlying reasons for struck and lost with the aim of decreasing it.				The need to review the underlying reasons for struck and lost, with the aim of decreasing rates. Work ongoing in CHM.	
The EGM recommends that the data be analysed by the statistical methods recommended in 2010. These analyses should include analysis of the efficiency of the backup (secondary) killing methods.	The dataset awaits analysis depending on resources.			Organised a seminar in 2016 on statistical analyses- Greenland and Iceland participated.	

Monitoring					Devloped a protocol for collection of TTD data in whale hunts with deck mounted harpoon gun. 2015
The EGM recommends that all hunts be monitored with regard to TTD and IDR at 10-year intervals unless other important issues arises that require more frequent monitoring.			Next should be in 2024.	Next should be in 2022.	NAMMCO AR 2015, page 20: Council meeting 2015 endorsed CHM recommendation to monitor TTD and IDR at 10-years intervals unless other important issues arise requiring more frequent monitoring.
The EGM recommends a workshop to look into alternative, and if possible, more economical methods for collecting standard TTD data that may also facilitate more frequent collection of data.					The need to organise a workshop on alternative methods for collecting standardised TTD data that are less expensive, thus making it easier to compare TTD between countries. CHM discussions ongoing.
Education and training					
The EGM emphasises the importance of the angle of the shot relative to the animal's long axis in the harpoon gun hunts. The recommended angle, based on the Norwegian data, is from 45 to 135 degrees relative to the animal's long axis and aiming the shot at the thorax. This information should be considered in training programmes for gunners.		NAMMCO manual on large whales	Included in the Icelandig courses.	These issues are emphasised in the Norwegian course for hunters.	The importance of increasing, through training, hunters' awareness of the influence of the shooting angle relative to the animal's body in order to reduce TTD.
Regular training and exchange of information is very important to achieve more efficient hunts and to improve animal welfare.					
The EGM emphasises the importance of combining theoretical information with actual meetings in order to exchange information and experiences, including sampling and recording of data.					

Note that harpoon gun and harpoon cannon are terms relating to the same weapon.

References:

NA	Not applicable
WS-1999	Workshop on hunting methods 9-11 February 1999
WS-2001	Workshop on Marine Mammals: Weapons, ammunition and ballistics, 13-15 November 2001
WS-2004	Workshop on Hunting methods for seals and walrus, 7-9 September 2004
WS-2006	Workshop on Struck and Lost in seal, walrus ad whale hunts, 14-16 November
EGM-2009	Expert Group meeting on best practices in hunting and killing seals, 24-26 February 2009
EGM-2010	1st Expert Group meeting on TTD in large whales, 17-18 February 2010
EGM-2011	Expert Group meeting on small whale hunting, 15-17 November 2011
EGM-2015	2nd Expert Group meeting on TTD in large whales, 4-6 November 2015
NAMMCO AR xxx	NAMMCO Annual Report year in question
CHM x.xx	Report of the Committee on Hunting Methods, meeting number, year in question
CHM Doc 01-2018	OVERVIEW OF MARINE MAMMAL HUNTING METHODS INC. NATIONAL REGULATIONS, MONITORING/OBSERVATION IN NAMMCO MEMBER COUNTRIES
Manual LW	Manual on maintenance and use of weaponry and equipment deployed in hunting of baleen whales in NAMMCO member countries
Manual SW	Manual on small whale hunting in Greenland