SUBMISSION TO THE NUNAVUT WILDLIFE MANAGEMENT BOARD

FOR

Information: **Decision: X**

Issue: Continued Implementation of an Interim Narwhal Flex-Quota System for 2016/17 Hunting Season

Background:

In April 2013, the Integrated Fisheries Management Plan (IFMP) for narwhal in the Nunavut Settlement Area came into effect. The IFMP provides for a staged, evidence based development and incorporation of Marine Mammal Tag (MMT) transfer in three phases (TAB 1). Tag transfer Phase I was implemented for the 2013/14 narwhal fishery and provides for simple quota reconciliation for communities that **do not** harvest from mixed narwhal stocks (e.g. communities that harvest from the Northern Hudson Bay narwhal Management Unit and the Somerset Island Management Unit).

Tag transfer Phase III was implemented on an interim basis for the 2014/15 and 2015/16 narwhal fisheries. Phase III provides for a "flexible" quota system whereby communities can carry-over their unused Marine Mammal Tags (MMT) to use for narwhal harvesting in the next harvest year. This is similar in concept to a provision that was implemented on a trial basis in the fishery under Community Based Management for narwhal and beluga in 5 Inuit communities for 10 years; but was never subject to scientific peer review for validation of sustainability.

Canadian Science Advisory Secretariat (CSAS) advice was published on the sustainability of tag transfer Phases II and III in 2015 (TAB 2). The results are encouraging, as they show little additional risk to the narwhal stocks from implementation of flexible total allowable landed catches. Phase II provides for simple transfers of migratory MMT similar to that outlined in Phase I, for the four communities on Baffin Island (Arctic Bay, Pond Inlet, Clyde River and Qikiqtarjuaq) that **do** harvest from mixed narwhal stocks.

In December 2013, DFO Resource Management, in consultation with DFO Science and DFO CITES Scientific and Management Authorities developed a draft 5-point quota carry-over rule for interim implementation in the narwhal fishery until the CSAS review and advice for implementation of narwhal tag transfer Phase III was completed.

The 5-point quota carry-over rule (TAB 3) provides for the use of unused narwhal Marine Mammal Tags (MMT) from one harvest season into the next season only, after which point they expire.

A Steering Committee Meeting for narwhal management took place on Jan. 20-21, 2016 among DFO, Nunavut Tunngavik Inc. (NTI), and Nunavut Wildlife Management Board (NWMB) staff. The flex-quota system was discussed during these meetings and there was general agreement among parties to revisit the five-point narwhal quota carry-over rule and tag transfer Phase II during tentatively planned consultations in 2016. Thus, tag transfer Phases II and III will not be considered for full implementation in the narwhal fishery until consultation has been completed.

In July 2014 and May 2015, the Minister of DFO accepted the NWMB's decisions to implement the interim narwhal flex-quota system for the 2014-15 and 2015-16 seasons, respectively.

Recommendations:

Pending support from the Regional Wildlife Organizations (RWOs), DFO and NTI recommend that the NWMB approve the proposed interim narwhal flex-quota system (Marine Mammal Tag Transfer Policy Phase III) for continuation for one more year, during the 2016-17 hunting season.

Attachments:

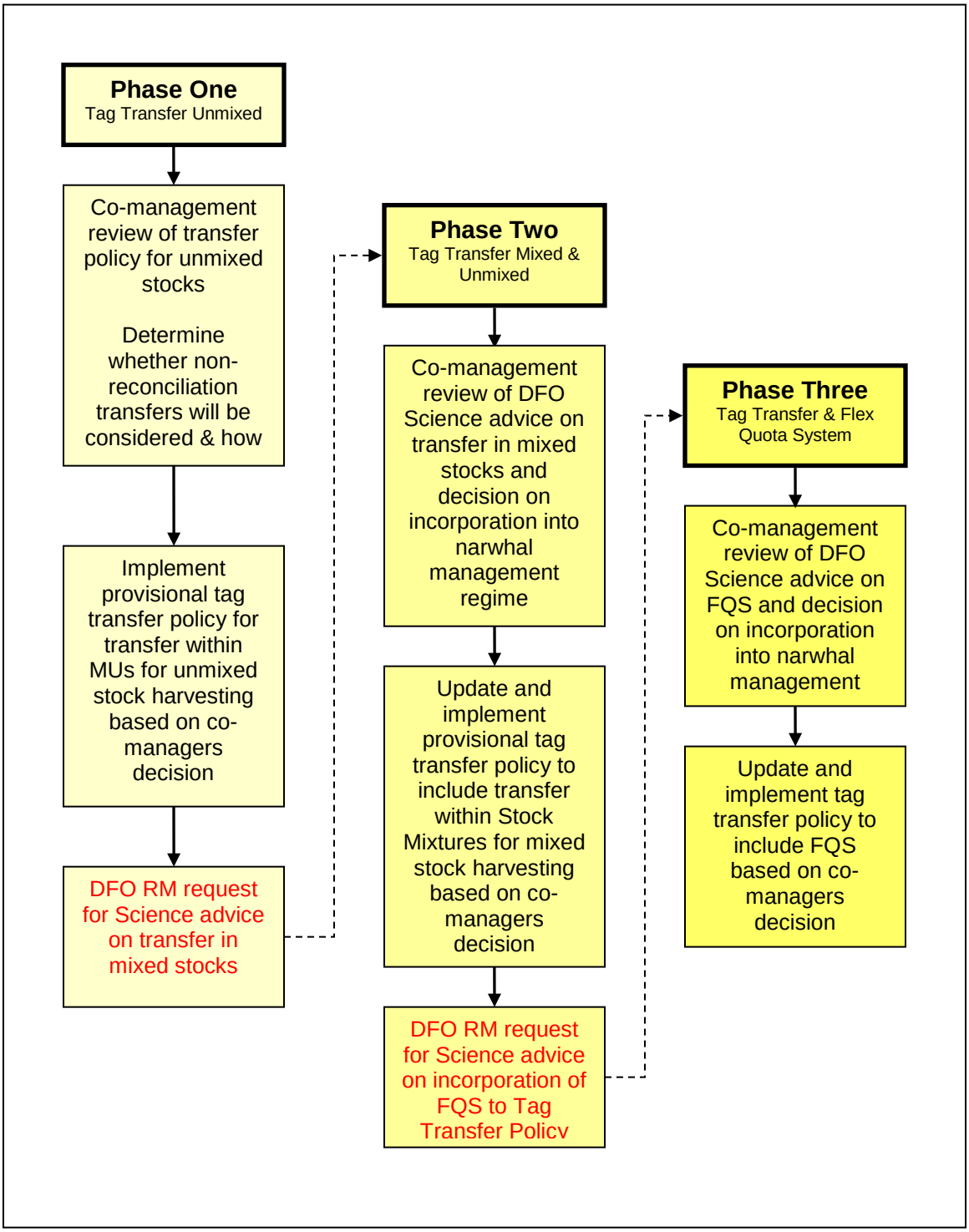
TAB 1:	Three Phase Narwhal Marine Mammal Tag Transfer Implementation
TAB 2:	DFO. 2015. Sustainability of a flexible system of total allowable annual catches of narwhals (*Monodon monoceros*). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2015/006.
TAB 3:	5-point quota carry-over rule
TAB 4:	2015-16 Narwhal Harvest Allocations under the 5-point quota carry-over rule
TAB 5:	Narwhal Marine Mammal Tag Transfer Policy

Prepared by: DFO Resource Management – Central and Arctic Region and NTI – Department of Wildlife and Environment

Date: Feb. 3, 2016

TAB 1

Figure 1. Flow chart depicting steps in a progressive, evidence based approach to development and implementation of a harvest tag/licence transfer policy for the 2013 narwhal fishery in the Nunavut Settlement Area. The chart delineates the steps required rather than the time sequence for the process.



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Central and Arctic Region

Canadian Science Advisory Secretariat
Science Advisory Report 2015/006

SUSTAINABILITY OF A FLEXIBLE SYSTEM OF TOTAL ALLOWABLE ANNUAL CATCHES OF NARWHALS (*Monodon monoceros*)

Narwhal (Monodon monoceros) by R. Phillips.

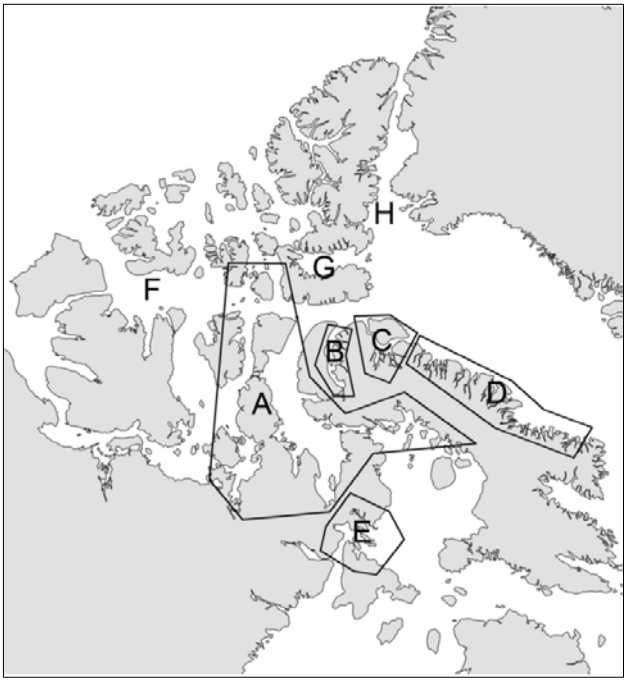

Figure 1. Approximate areas where Canadian summering aggregations of narwhals occur: A - Somerset Island, B - Admiralty Inlet, C - Eclipse Sound, D - East Baffin Island, E - Northern Hudson Bay. Other areas where narwhals are known to occur in summer: F - Parry Islands, G - Jones Sound, H - Smith Sound) [adapted from DFO 2011].

Context

There are presently five recognized narwhal summering stocks in the Canadian Arctic: Somerset Island, Admiralty Inlet, Eclipse Sound, East Baffin Island, and Northern Hudson Bay (Fig.1 A-D). Hunts on these narwhal stocks are managed by setting an annual Total Allowable Landed Catch (TALC) for each stock for a five-year period. The TALC is based on a Potential Biological Removal (PBR) estimate calculated for each stock, minus estimated hunting losses (i.e., struck and lost). The present analysis is in response to requests by Resource Management (RM) for peer reviewed science to address the questions of sustainability of a flexible TALC system for narwhals. There are also narwhals summering in Jones Sound, Smith Sound and the Parry Islands water (Fig. 1 F-H). Their stock definition and status is uncertain but advice given here would apply once assessments allow the setting of total allowable land catch limits.

April 2015

Canada

SUMMARY

- There is a desire on the part of Inuit to have a "flexible quota system" management provision implemented in narwhal hunts, similar to what was employed under Community Based Management (CBM) of narwhal in Nunavut, i.e., to carry-over (credit) unused Total Allowable Landed Catch (TALC) for use in the subsequent hunting season or to borrow (debit) from the following years' TALC for use in the current hunting season
- Results of a deterministic model to investigate the robustness of a flexible TALC system clearly indicate that, for the scenarios investigated, such a management approach is sustainable, as long as the total hunting mortality over the five year period does not exceed five times the annual PBR.
- Key assumptions of the deterministic model are:
    a. birth and death rates are constant,
    b. PBR is updated every ten years with new abundance estimates,
    c. Hunting loss is a constant fraction of TALC, and
    d. flexible hunting limits are adhered to by all and landed catches are reported exactly (i.e., no implementation errors).
- Process error model results, which account for some variability of birth and death rates, showed a greater risk of the population becoming depleted under certain credit or debit scenarios but the risk was similar to the base scenario run for comparison where no debit or credit was applied.
- Better estimates of hunting loss rates would increase confidence in model results. These model results do not account for impacts of large ice entrapment mortality. These are rare events and have been the subject of previous science advice. A more detailed assessment of population trend would be warranted were there evidence of deterministic environmental effects on narwhal birth and death processes.

INTRODUCTION

There are presently five recognized narwhal summering stocks in the Canadian Arctic: Somerset Island, Admiralty Inlet, Eclipse Sound, East Baffin Island, and Northern Hudson Bay. Hunts on these narwhal stocks are managed by setting an annual Total Allowable Landed Catch (TALC) for each stock that remains constant for a five-year period. The TALC is based on a Potential Biological Removal (PBR) estimate calculated for each stock, minus estimated hunting losses. The present analysis is in response to requests by Resource Management (RM) for peer reviewed science to address the questions of sustainability of a flexible TALC system for narwhals.

Question 1: Is it sustainable if Arctic Bay and Pond Inlet exchange their unused spring and fall Marine Mammal Tags for use by either community during their migratory (spring/fall) narwhal hunts? The same question was also posed for Clyde River and Qikiqtarjuaq.

Question 2: Harvest credit (or carry-over) in a five year period:

a. Is 100% carry-over for one year sustainable?
b. What % carry-over for one year is sustainable?
c. What % cumulative carry-over is sustainable over consecutive years (up to five years)?

Question 3: Harvest debit (or borrow-back) in a five year period:

a. Is 100% borrowing from the following year sustainable once in a five year period?
b. What % borrowing from the following year is sustainable?
c. Can the total five consecutive years' total allowable catch be allocated to each year, in a five year period, any way the hunters choose as long as the sum of the five-years of catch does not exceed that total?

Question 4: How sustainable would a hunting mortality of five times the total allowable catch if applied to any one year of a five year period?

ASSESSMENT

Question 1: This question was addressed by previous science advice (Richard 2011). In short, the two communities in question,

a. Arctic Bay and Pond Inlet, or
b. Clyde River and Qikiqtarjuaq, are hunting from the mixed stocks in spring and fall and therefore are taking from the same stocks' TALCs.

Consequently, the harvest credits are transferable between Arctic Bay and Pond Inlet, or between Clyde River and Qikiqtarjuaq without invalidating previous advice on the sustainability of the affected stocks.

The remaining four questions required new analyses. They were performed using a variant of the Wade (1998) PBR robustness trial method, where a proportion of the PBR for a stock was either carried over (credited) to the subsequent year to make-up for a low catch year or borrowed (debited) from the next year if a given year's catch was higher than the annual PBR. Several scenarios were modelled in deterministic projections for 100 years, as in Wade (1998), varying start populations from 5,000 to 15,000 and recovery factors from 0.5 to 1. The details of the simulations are given in Richard and Young (2015).

In all cases, more than 95% of projected populations reached sizes in excess of the Maximum Net Productivity Level. The results of these simulations of flexible catch limits did not depart much from the base models, where no credits or debits were exercised.

The same simulations were done with an added parameter for process error, i.e., a parameter simulating variation in population dynamics (Richard and Young 2015). This process error, arbitrarily set at 0.05, to reflect our belief that narwhals do not have highly variable population dynamics, resulted in more variable results for debit or credit scenarios than the deterministic runs, but none of scenario results were significantly worse than the results of base models without debits or credits.

These results indicate that a system of flexible Total Allowable Landed Catches is sustainable, as long as the total hunting mortality over each five-year period does not exceed five times the PBR for that period. The modelling results also show that the choice of a fixed recovery factor of 1 does not significantly increase the risk to sustainability of credit or debit scenarios.

Sources of Uncertainty

The above conclusions are based on models with some important assumptions. The first is that TALCs are a constant fraction of total hunting mortality, i.e., that hunting losses are constant and very similar to what was used to provide TALC advice for narwhal stocks (0.28 from Richard 2008). Hunting losses may in fact vary from area to area, from season to season and with different hunting methods. Unfortunately, we have insufficient data at present to determine

those variations and apply them in modelling. Nevertheless, the PBR method has been shown to be robust to under-estimates of actual hunt mortality (Wade 1998).

Second, we assume that sources of human-induced narwhal mortality other than total hunting mortality (landed catch and hunting loss) are negligible. We have no reason to believe otherwise at present.

Third, we assume that flexible hunting limits are adhered to by all and that landed catches are reported exactly, that there are no implementation errors. Presently, we know of no reason to believe that narwhal landed catches are not reported accurately, but there have been no independent studies to verify this assumption. Perhaps this concern is moot as the latest records of narwhal catches (DFO) indicate that landed catches are, in many cases, lower than TALCs.

The models do not take into account the impact of rare ice-entrapment mortality, nor do they include environmental effects that might negatively impact birth and death processes in narwhal populations. Large ice entrapments are rare but can have a significant short-term impact on population trend. Science advice on one such entrapment event can be found in DFO (2012). Environmental impacts on birth and death processes in narwhal populations are unknown at present but, should there be evidence of long-term negative effects, more detailed narwhal population assessments would be needed.

CONCLUSIONS

These results are encouraging for the implementation of flexible TALCs, as they show little additional risk to the narwhal stocks from implementation of flexible TALCs. If a flexible TALC system is implemented, the five-year total landed catch should not exceed five times the annual TALC for each stock.

SOURCES OF INFORMATION

This Science Advisory Report is from the October 20-24, 2014 Annual Meeting of the National Marine Mammal Peer Review Committee (NMMPRC). Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2011. Advice regarding the genetic structure of Canadian narwhal (*Monodon monoceros*). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/021.

DFO. 2012. Effect of 2008 ice entrapment on the Eclipse Sound narwhal total allowable landed catch. DFO Can. Sci. Advis. Sec. Sci. Resp. 2012/020.

Richard, P.R. 2008. On determining the Total Allowable Catch for Nunavut odontocete stocks. DFO Can. Sci. Advis. Sec. Res. Doc. 2008/022: iv + 12 p. (Erratum September 2008).

Richard, P.R. 2011. Allocation model for landed catches from Baffin Bay narwhal stocks. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/056: iv + 27 p. (Erratum December 2011)

Richard, P.R., and Young, R. 2015. Evaluation of the sustainability of a flexible system of total allowable annual catches of narwhals (*Monodon monoceros*). DFO Can. Sci. Advis. Sec. Res. Doc. 2015/006. iv + 13 p.

Wade, P.R. 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. Mar. Mamm. Sci. 14: 1-37.

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Aussi disponible en français :

*MPO. 2015. La durabilité d'un système de limites flexibles de captures de narvals (*Monodon monoceros*). Secr. can. de consult. sci. du MPO, Avis sci. 2014/006.*

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TAB 3

Five-point narwhal quota carry-over rule

1. All unused quota for a given harvest season within MU is carried-over for use in the subsequent harvest season. (i.e. summer to summer; migratory to migratory; all season to all season)

2. Carried-over quota (MMT) is applied first to any narwhal harvests in the subsequent harvest season before current season quota (MMT) is applied to harvest.

3. Carried-over quota expires at the end of the harvest season for which it was carried-over into.

4. The system resets to zero whenever the TAH for a MU is modified by the NWMB (i.e. unused quota in a MU prior to the TAH modification cannot be carried-over into the subsequent harvest season under the “new” TAH)

5. All other rules of tag transfer Phase I still apply. No transfer of MMT between MUs. No transfer of summer MMT with migratory MMT within a MU.

Table 1. Draft 2016-17 Narwhal Harvest Allocations under an Interim Flex-Quota System*.

Management Unit	Community	Season	2015-16 MMT Base Allocation	2015-16 MMT Carryover	2015-16 MMT Allocation	2015-16 Reported Landings	2015-16 MMTs Available for Carry-over	Potential 2016-17 MMT Allocation
Northern Hudson Bay	11 Communities	All-Season	147	84	231	48	147	294
Admiralty Inlet	Arctic Bay	Summer	125	31	156	156	0	125
		Migratory	65	49	114	109	5	70
Eclipse Sound	Pond Inlet	Summer	137	74	211	112	99	236
		Migratory	53	25	78	78	0	53
East Baffin Island	Clyde River	Summer	42	24	66	58	8	50
		Migratory	28	5	33	2	28	56
	Qikiqtarjuaq	Summer	42	42	84	18	42	84
		Migratory	78	13	91	45	46	124
	Pangnirtung & Iqaluit	All-Season	60	60	120	0	60	120
Somerset Island	8 Communities	All-Season	450	450	900	72	450	900
Smith Sound, Jones Sound, Parry Channel	Grise Fiord	All-Season	50	50	100	8	50	100

Note: MMT = Marine Mammal Tag.

* Note: Harvest statistics for 2015-16 are still being finalized. Interim statistics have been presented in this table.

Appendix 5 – Marine Mammal Tag Transfer Policy

Phase One[1]: Marine Mammal Tag transfers for narwhal harvesting when stocks are not mixed[2].

The purpose of Marine Mammal Tag transfers is to assist Regional Wildlife Organizations (RWOs) to:

1. Cover off over-harvest of a Community Harvest Limit (CHL) by allowing the exchange of unused Marine Mammal Tags between communities within the management unit, during the current narwhal harvesting year

2. Plan for, and allow, transfers of Marine Mammal Tags between communities within a management unit, during the current narwhal harvesting year, to maximize harvests in response to year to year variance in narwhal availability.

3. When there are not enough unused Marine Mammal Tags available for exchange, reconcile over-harvests within the management unit by reducing the following year's allocation and harvest from the community that over-harvested

General provisions of Phase One:

1. Following the establishment of a Total Allowable Harvest Level (TAH) and Basic Needs Level (BNL) for each narwhal stock/population and the establishment of corresponding management units based on known summering areas, the BNL for each stock/population will be allocated annually, by the RWO to the Hunter and Trappers Organizations (HTO), in each management unit. The allocation will be in the form of Community Harvest Limits. Depending on whether or not a community harvests from mixed migratory stocks, each community will receive either an All-Season Community Harvest Limit, or a Summer-Season and Migratory-Season Community Harvest Limit. The number of Marine Mammal Tags a community receives will correspond to its Community Harvest Limit(s) (All- Season, Summer-Season and Migratory-Season).

2. A valid Marine Mammal Tag is required to hunt a narwhal.

3. Individual Marine Mammal Tags may only be used to land one narwhal.

4. Marine Mammal Tags may only be used in the harvest season for which they were issued. At the end of the season, any unused tags expire and cannot be used in subsequent years.

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[1] These basic transfer provisions will be amended/expanded as required to reflect DFO Science advice on incorporation of mixed stock transfer in phase two and to reflect DFO Science advice on incorporation of a flexible quota system to the tag transfer policy in phase three (see figure 1).

[2] In the four Baffin Bay management units, stocks are not mixed when whales are in their summering areas. In the Northern Hudson Bay management unit, the stock is not mixed throughout the entire year

5. The transfer of Marine Mammal Tags is not permitted between management units.

6. Transfers of Marine Mammal Tags are subject to RWO(s) pre-approval.

7. Marine Mammal Tag transfers between communities in a management unit are allowed for harvesting when stocks are not mixed, for the purposes identified above (i.e. to cover off an individual community's over-harvest, to maximize harvests or to reconcile over-harvests within the management unit) subject to pre-approval by the RWO(s).

8. Marine Mammal Tag transfers cannot occur once the sum of the Community Harvest Limit(s) (All-Season, Summer-Season) for that management unit in any given harvest season is reached.

9. Marine Mammal Tag transfers cannot occur during the Migratory-Season in any management unit.

10. In the event that insufficient Marine Mammal Tags are available within a management unit for harvest reconciliation, community over-harvests will be reconciled with a compensatory reduction in that HTO's annual Community Harvest Limit (All-Season, Summer-Season) by the RWO for the next narwhal harvest season.

11. Requests for Marine Mammal Tag transfers for any other purposes (e.g. cross-species tag transfers or barters for wildlife products) will be forwarded to the NWMB by the RWO for the management unit for decision on a case-by-case basis as per their authority under NLCA s.5.2.33 (k). Such requests can only be considered if the transfer does not jeopardize the conservation status of the stocks or populations of wildlife in question and does not violate the terms of the management regimes governing the specific wildlife species in question.