

Comments on DFO's Published Science
Advice and Harvest Data:
Reconciliation of Narwhal
Management with Inuit



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When Should Telemetry Studies and Surveys Happen? [1 of 4]

- DFO Science uses surveys to estimate narwhal populations, from which they then recommend Total Allowable Harvests (TAHs) to the NWMB and the Minister.
- Telemetry studies provide information about the diving behaviour of narwhal, in order to generalize estimates of narwhal at the surface to include the potential abundance of diving narwhal, and then estimate the whole population.
- Both types of studies impact the number of narwhal that Inuit may be allowed to harvest.

When Should Telemetry Studies and Surveys Happen? [2 of 4]

- Because both surveys and telemetry studies directly impact Inuit harvesting, they should both be done during the same period of time.
- DFO reports state that July 24/25 – August 24 is the best time to do surveys.
- Watt and Hall (2018) wrote that July 24 – August 24 “represent[s] the residency time of narwhals in the summering region” (if residency occurs).
- It is logical that telemetry studies should be done during that same period.

When Should Telemetry Studies and Surveys Happen? [3 of 4]

- If telemetry data does not cover at least half of the survey period, then the data would have little value for estimating population size and the TAH.
- In 2012, telemetry data from all 5 narwhal covered less than half of the survey period (19-38%).
- In 2016, all 5 more tagged narwhal again covered less than half of the survey period (0-22%).
- In 2018, both tagged narwhal again covered less than half of the survey period (22%).
- Telemetry data in these years has minimal value for determining Inuit harvest levels.

When Should Telemetry Studies and Surveys Happen? [4 of 4]

- 2017 was a mixed bag!
- 7 tagged narwhal provided data for more than half of the survey period (65-81%).
- 2 tagged narwhal provided data for less than half of the survey period (32-42%).
- And 9 tagged narwhal did not provide any data for the survey period (0%).
- Diving telemetry data for estimating population size and TAH should be used when the data were collected during the survey period, ideally in the same year as each survey.

Can Telemetry Data Really Detect Mixing of Narwhal between Areas?

- Not if they are tagged in only one part of one small management area, and in only one area in the same year!
- When narwhal mix, they move between any of the areas in any direction. The rate of mixing may not be equal in all directions. They do not do the same things every year.
- DFO has not tagged narwhal in all three areas each year, especially East Baffin, ignoring IQ!
- DFO has not tagged narwhal in all parts of any area in any year!

Are Tagged Tremblay Sound Narwhal Representative of All Eclipse Sound Narwhal? [1 of 3]

- IQ tells us that narwhal are always moving during summer, including during July 24 – August 24. Survey and harvest data supports this (more later).
- In other words, IQ tells us that DFO's hypothesized narwhal summer residency period is **NOT** real!
- Inuit and their ancestors have been on Baffin Island for an estimated 3,500 years or more.
- Ferguson et al (1997, 1998) documented accurate and detailed recall by Inuit of information about caribou dating back 80-100 years.
- It is likely that Inuit knowledge about narwhal has similar accuracy, detail and longevity.

Are Tagged Tremblay Sound Narwhal Representative of All Eclipse Sound Narwhal? [2 of 3]

- Is it likely that DFO Scientists in Winnipeg know true basic information about narwhal movements and distributions that Inuit have never heard of?
- As mentioned, IQ indicates that narwhal in different parts of Eclipse Sound (ES) tend to move in different directions, but not always.
- In 2017, DFO tagged only 7 out of perhaps 12,000 narwhal in ES for most of the survey period (i.e., 0.06%)! Can only 7 show behaviors of all 12,000?
- 7 at one site, compared to probably 1,000s of narwhal observed by Inuit across most of ES in 2017. Is Science or IQ more likely to be reliable?

Are Tagged Tremblay Sound Narwhal Representative of All Eclipse Sound Narwhal? [3 of 3]

- None of the narwhal tagged during 2012 - 2018 were tagged in Eclipse Sound on or about July 24.
- Two tagged narwhal moved from the mouth of Navy Board Inlet into Admiralty Inlet in about 16 hours during August 7-8, 2017.
- Narwhal could move much farther in the 7 – 29 days before tagging during summer survey period.
- I suggest that not all narwhal tagged during 2012-2018 represent ES narwhal because DFO cannot know if any of tagged narwhal were in Eclipse Sound, Admiralty Inlet or East Baffin at the start of the summer survey period.

Does Tagging Data or IQ Better Reflect the Years that Any Given TAH May Be in Place?

- Telemetry tags usually monitor narwhal movement for only part of a year, and very rarely for a full year or more.
- In January 2020, DFO offered no clear methods or plans to obtain the required information (C. Watt, DFO, pers. com.) to address multi-year fidelity or infidelity of narwhal to so-called summer stocks.
- During the same workshop in Winnipeg, Eric Ootoovak of Pond Inlet repeatedly told DFO staff that “summer stocks do not exist.”
- Eric, other HTO reps and the QWB initiated their first consultations with DFO in January 2020.

More 2016 Eclipse Sound Survey Results

- Total Abundance Estimate: 12,000
- 2020 TAH recommendation: 117
- However, changes occurred during 2016 Summer Survey Period, based on Surface Estimates (below). Telemetry data exists from only one of 6 parts of ES. Abundance in that one area changed the least of four re-surveyed areas.

August	Navy Board	Pond Inlet	Eclipse Sound	Milne Inlet	Tremblay Sound	Koluktoo Bay
7-10	0	0	1,924	853	407	602
21	?	?	85	1,257	525	884
Change	?	?	-96%	+47%	+29%	+47%

Do Such Changes within the Survey Period Occur Elsewhere? Based on IQ and Science, Yes!

2010 Survey Results for Admiralty Inlet

- Two repeated surveys with some differences in survey coverage.
- August 7-8, 2010 Estimate: 24,398
- August 10-11, 2010 Estimate: 13,729
- Change in only 4 days: -10,699 (-44%)
- Explanation: “sampling variation related to survey coverage, sea state and animal movement”
- TAH was based on the average: 233
- Change may have been real, or caused by survey methods.
- Such issues impact Inuit harvesting. How were QWB and the HTOs consulted? Did DFO reveal the change?

Do Such Abundance Changes between Surveys Occur over Large Areas and between Years? Based on IQ and Science, Yes!

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Reference No. 1663724-285-TM-Rev1-48000

Baffinland Iron Mines Corporation

7 April 2021

Table 2: Historical Abundance Estimates for Eclipse Sound and Admiralty Inlet Narwhal Summer Stocks

Stock	Year	Abundance	CV	95% CI	Source
Eclipse Sound	2013	10,489	0.24	6,342–17,347	Doniol-Valcroze et al. 2015
Eclipse Sound	2016	12,039	0.23	7,768–18,660	Marcoux et al. 2019
Eclipse Sound	2019	9,931	0.05	9,009–10,946	Golder 2020
Eclipse Sound	2020	5,018	0.03	4,736 – 5,317	Golder 2021a
Admiralty Inlet	2013	35,043	0.42	14,188-86,553	Doniol-Valcroze et al. 2015
Admiralty Inlet	2019	28,746	0.15	21,545-38,354	Golder 2020
Admiralty Inlet	2020	31,026	0.14	23,406-41,126	Golder 2021a
Eclipse & Admiralty	2013	45,532	0.33	22,440–92,384	Doniol-Valcroze et al. 2015
Eclipse & Admiralty	2019	38,771	0.12	30,667–49,016	Golder 2020
Eclipse & Admiralty	2020	36,044	0.12	28,267–45,961	Golder 2021a

Does the Resident Summer Stock Hypothesis Enable Consistent Summer Harvesting?

- If narwhal actually return to the same specific areas each summer, then Inuit should be able to find those places, and harvest consistent numbers of narwhal in those places each summer.
- Such a harvest strategy based on resident summer stocks should result in more consistent harvests during summer year after year compared to any other season for each community.
- There should be less variation in community harvest numbers between years during summer than during any other season.

Do Annual Harvests Support the Summer Stock Hypothesis or Inuit Qaujimajatuqangit?

- NWMB and DFO manage Inuit narwhal harvesting, not narwhal movements and distributions.
- Somerset Island and Northern Hudson Bay narwhal are harvested mainly by 8-11 communities each, with RWOs allocating harvest among Inuit, and without any summer seasons.
- Admiralty Inlet, Eclipse Sound and East Baffin narwhal are harvested by mainly 1-2 communities each that have summer seasons and allocations to Inuit effectively imposed by DFO.
- Are NEBI narwhal really so very different from SI & NHB narwhal? Inuit KNOW that they are not!

Seasons of NEBI Narwhal

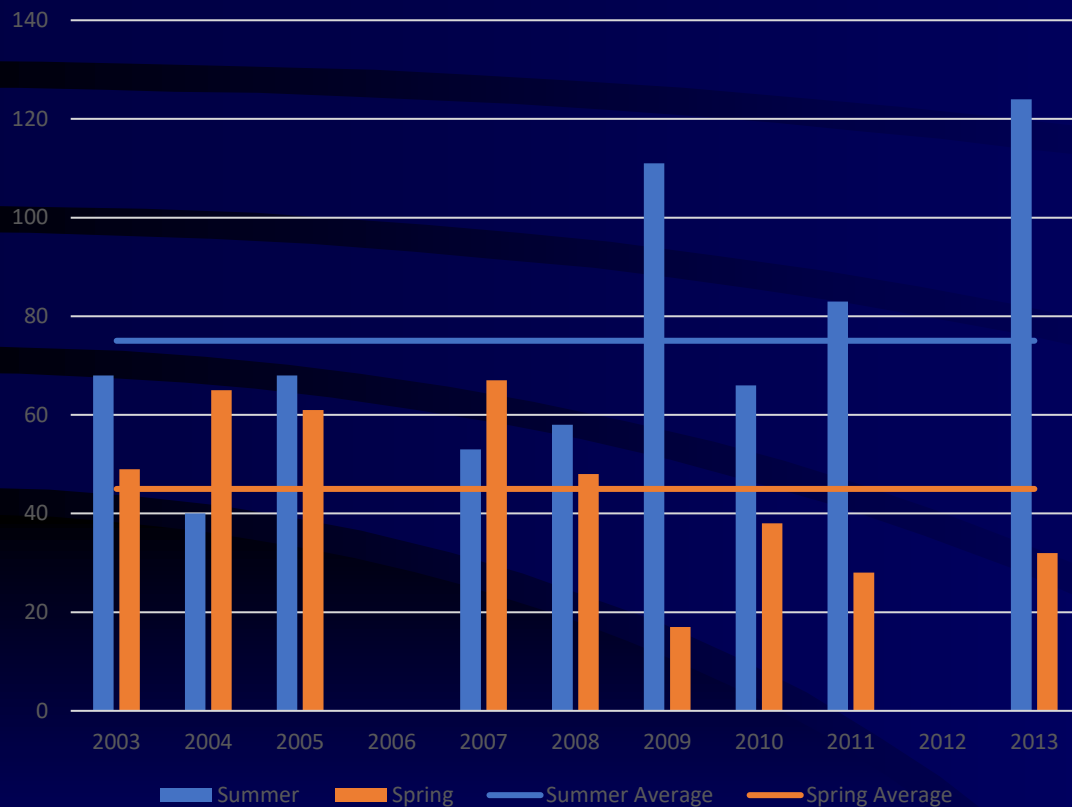
- Watt and Hall (2018) defined harvest seasons for narwhal. I went through the detailed harvest records for Arctic Bay, Pond Inlet, Clyde River and Qikiqtarjuaq from 2003 to 2013. I refined the dates for the spring and fall harvests, but I did not change DFO's summer dates.
- Spring: May 2 – July 23
- Summer: July 24 – August 24
- Fall: August 24 – November 4
- Qikiqtarjuaq and Clyde River usually started harvesting in July, with little harvesting in spring and summer. They harvested latest into the fall.

Simple Hypothetical Example of Assessing Variation in Harvest Numbers between Seasons

Season	Annual Seasonal Harvest			Average Seasonal Harvest	Coefficient of Variation
	2030	2032	2033		
Summer	39	41	40	40	2
Spring	70	5	45	40	67

- The Coefficient of Variation can tell us in which season harvests are most consistent, and in which season harvests differ most between years.
- In the above example, harvests would be very consistent in Summer, while harvests in Spring are over 30 x more variable than in Summer.

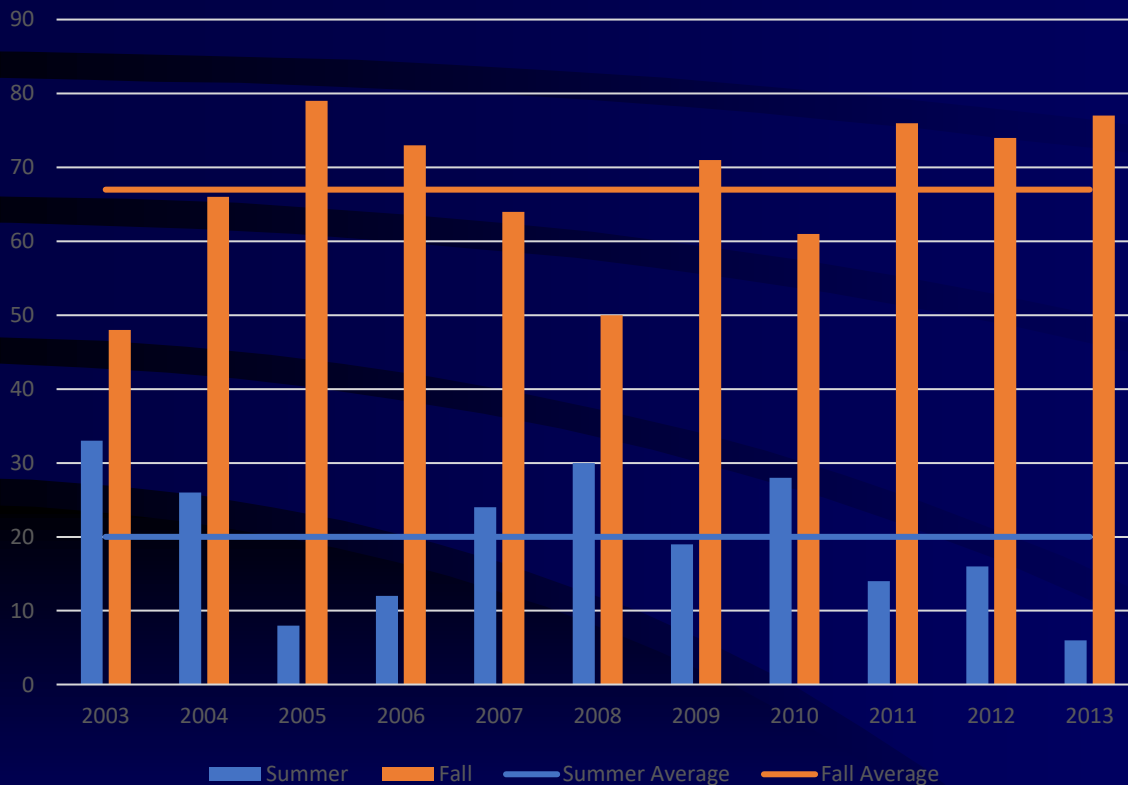
Summer (blue) and Spring (orange) Harvests, 2003-2013 Arctic Bay.



Arctic Bay may not have had enough tags in summer in 2006 and 2012, and very rarely in fall.

- Coefficient of Variation was 34 in Summer, and 37 in Spring.
- Harvest Variation in Summer and Spring were similar.
- No evidence in harvest data for greater residency of so-called summer stock.

Summer (blue) and Fall (orange) Harvests, 2003-2013 Qikiqtarjuaq



Qikiqtarjuaq appeared to have enough tags in all years in summer and fall.

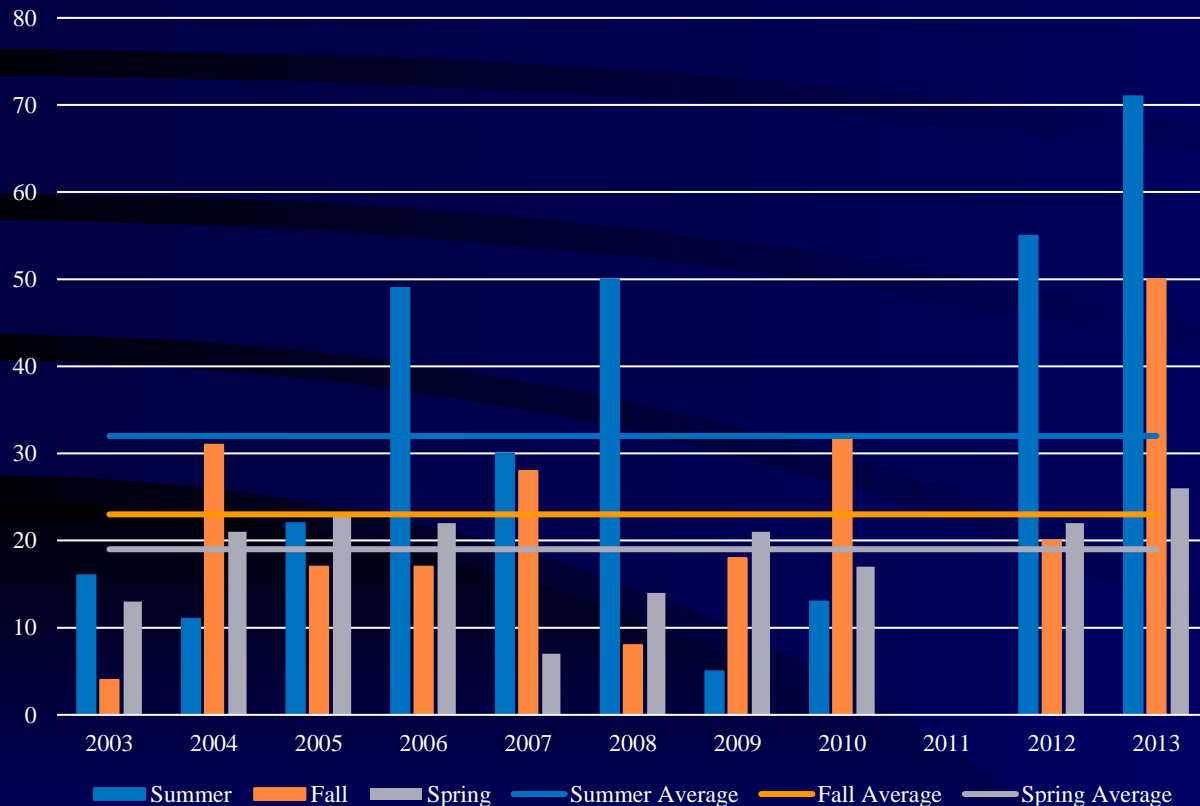
- Coefficient of Variation was 44 in Summer, and 15 in Fall.

- Harvest Variation in Summer about 3 x greater than in Fall.

- No evidence in harvest data for residency of so-called summer stock.

Summer (blue), Fall (orange) and Spring (grey) Harvests, 2003-2013

Pond Inlet

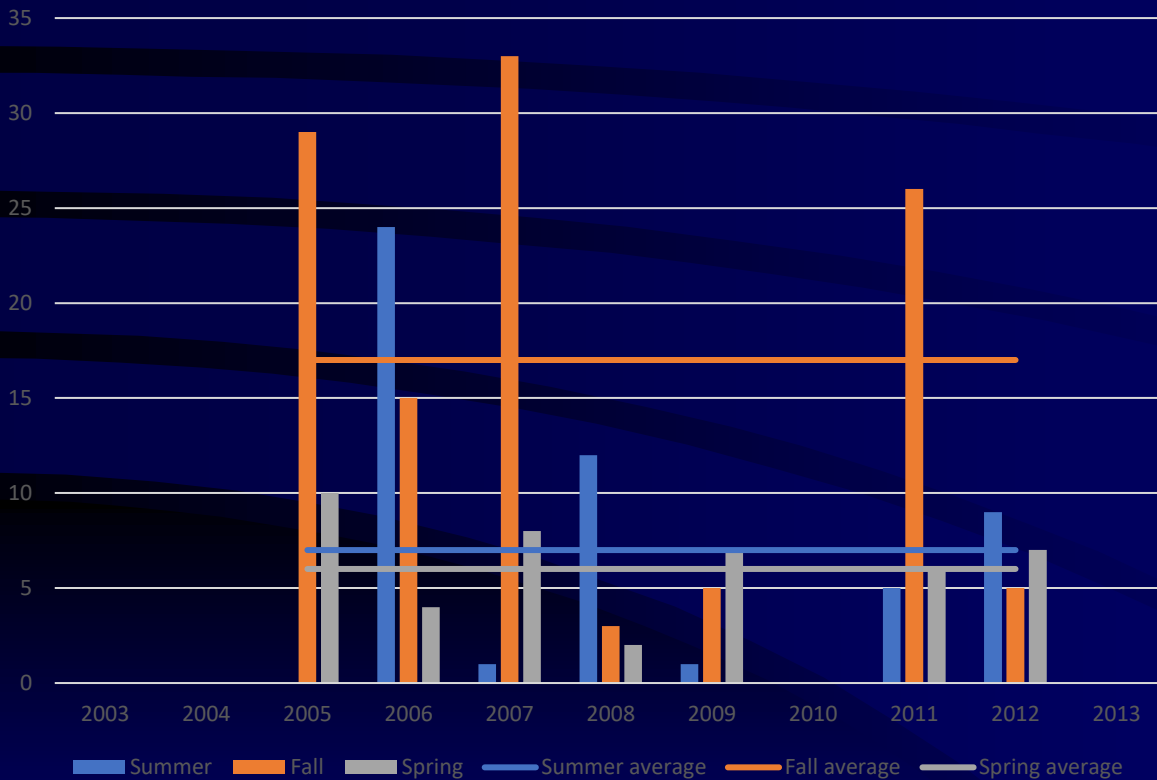


- Pond Inlet may not have had enough tags in 2011, but usually had enough in all 3 seasons.
- Coefficient of Variation was 67 in Summer, 55 in Fall and 29 in Spring.
- Harvest Variation in Summer was greater than in both Fall and Spring.
- **No evidence in harvest data for residency of so-called summer stock.**

Data from: Watt, C.A. and Hall, P. 2018. Catch statistics for narwhal (*Monodon monoceros*) in Canada from 1970-2015. Can. Tech. Rep. Fish, Aquat. Sci. 3270: 290 p.

Summer (blue), Fall (orange) and Spring (grey) Harvests, 2003-2013

Clyde River



- Clyde River may not have had enough tags in 2003, 2004, 2010 and 2013.
- Variation was 114 in Summer, 69 in Fall and 41 in Spring.
- Harvest Variation in Summer was greater than in both Fall and Spring.
- No evidence in harvest data for residency of so-called summer stock.

“There are No Summer Stocks!”

- Summer management of harvesting is neither efficient nor effective for any of the 4 communities because of harvest variation in summer is as high or higher than other seasons.
- NEBI HTOs tried to make summer-stock harvest management work for 8 years, but just can't!
- Eric Ootoovak told DFO several times in January 2020 that “there are no summer stocks”.
- The harvest data and surveys show that Inuit have been right! IQ is true, and Inuit Systems work!
- Will DFO reconcile with Inuit, and support Inuit Systems of NEBI narwhal management for at least a comparable period of 8 years, by May 2022?

