ESTIMATES OF ABUNDANCE AND TOTAL ALLOWABLE REMOVALS FOR ATLANTIC WALRUS (*Odobenus rosmarus rosmarus*) IN THE CANADIAN ARCTIC

Atlantic Walrus Odobenus rosmarus rosmarus (Jason Hamilton, DFO)

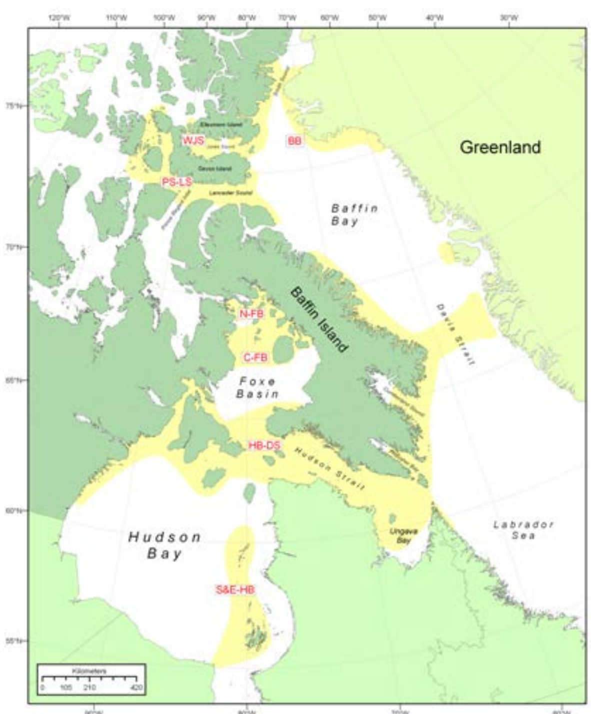

Figure 1. Distribution of Atlantic walrus stocks (names in red) in the Canadian Arctic (from Stewart and Hamilton 2013).

Context

Walrus in the Canadian Arctic are divided into two genetic populations comprised of seven stocks. The high Arctic population is composed of the Baffin Bay (BB), west Jones Sound (WJS) and Penny Strait-Lancaster Sound (PS-LS) stocks; the central Arctic population is composed of the north and central Foxe Basin (N-FB, C-FB) and Hudson Bay-Davis Strait (HB-DS) stocks (Figure 1). At this time, the relationship between these six stocks and walrus distributed in south and east Hudson Bay (S&E-HB) is unknown.

Ecosystems and Fisheries Management within Fisheries and Oceans Canada (DFO) asked Science to provide population estimates and sustainable harvest advice for Canadian walrus stocks. A previous attempt to provide this advice was unsuccessful because available stock abundance estimates and harvest information was insufficient (Stewart 2008). Aerial surveys conducted in 2007-2011 permitted the calculation of abundance estimates for all stocks except S&E-HB. This document summarizes calculated estimates of abundance and corresponding estimates of total allowable removal (TAR), developed using the Potential Biological Removal (PBR) method, for six walrus stocks.

This Science Advisory Report is from the October 29 to November 2, 2012 annual meeting of the National Marine Mammal Peer Review Committee (NMMPRC). Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule as they become available.

SUMMARY

- Results of recent aerial surveys and satellite telemetry studies were used to develop abundance estimates for six walrus stocks that make up the high Arctic and central Arctic populations in Canada.
- Individual stock abundance estimates are likely negatively biased, due to incomplete survey coverage, inter-annual variability in walrus distribution, weather and ice conditions.
- The quality and amount of satellite tag data, used to adjust surveys for animals missed by the survey, varied among surveys and, at least in Foxe Basin, may not have been representative of the whole population. More satellite data are required to develop better adjustment factors for the haulout counts.
- Based upon the derived abundance estimates, a range of total allowable removals (TARs) was calculated for each stock using the Potential Biological Removal method (PBR). For each stock, these estimates were compared to reported harvests in Canada between 1985 and 2010.
- The Baffin Bay (BB) stock was estimated at approximately 1,250 walrus in 2009, based on a count of 571, resulting in a TAR of 10-11.
- The west Jones Sound (WJS) stock was estimated at 503 (coefficient of variation (CV) = 0.07) walrus in 2008, based on a count of 404, resulting in a TAR of seven or eight.
- The Penny Strait-Lancaster Sound (PS-LS) stock was estimated at between 661 (CV = 2.08) and 727 (CV = 0.07) walrus in 2009, based on a count of 557, resulting in a TAR of 10-12.
- Partitioning harvest to the three stocks comprising the high Arctic population was not possible, but the 25-year average reported harvests in Canada (approximately 14) are less than the combined TAR sum (27-31).
- Estimated size for the combined north and central Foxe Basin stocks (N&C-FB) in 2011 ranged from 8,153 (CV = 0.07) to 13,452 (CV = 0.43) walrus, based on counts of 6,043 and 4,484, respectively, using different dates and different adjustment factors. The calculated TARs of 106-166 straddle the lower 95% confidence limit of recent harvest levels (approximately 185), which do not include other human-caused mortality. Better survey coverage and better information on current removals are required, as is further investigation into walrus movements within Foxe Basin and exchange with the larger Hudson Bay-Davis Strait stock.
- Only a small portion of the Hudson Bay-Davis Strait (HB-DS) stock range has been surveyed. Numbers of walrus summering in the Hoare Bay area on southeast Baffin Island in 2007 were estimated at between 1,420 (CV = 0.07) and 2,533 (CV = 0.17), based on a count of 1,056. The calculated TARs are 18-38 and the local harvest is approximately 36.
- The central Arctic population as a whole lacks sufficient data for a meaningful population estimate and subsequent advice on TARs.
- Uncertainty exists for all areas: survey counts are negatively biased; most surveys suffer from incomplete coverage; most adjustment factors are based on small samples or data from other places and times; harvest statistics are incomplete and losses unreported.
- The BB stock and the West Greenland-southeast Baffin Island component of the HB-DS stock are shared with Greenland. Further investigations into movement patterns between Canada and Greenland and total hunting mortality from both countries are required.
- The estimates of TARs presented cannot be partitioned among various sources of human-caused mortality. For all stocks, additional information is required about harvest levels,

hunting losses, and other types of human-caused mortalities such as net entanglement and ship strikes before providing sustainable harvest advice.

INTRODUCTION

Walrus in the Canadian Arctic have been divided into two genetic populations and seven stocks (Figure 1) based on genetic, isotope, satellite tag, and elemental analysis. DFO Science was asked to provide abundance estimates and sustainable harvest advice for each of the seven walrus stocks: the BB, WJS and PS-LS stocks of the high Arctic population; the N-FB, C-FB and HB-DS stocks of the central Arctic population; and the S&E-HB stock. The S&E-HB stock is not considered in this report since there is no associated stock assessment information available.

Walrus are widely distributed in the eastern Canadian Arctic and are most often found in aggregations of tens to thousands. During summer months, groups of walrus often haul out on ice floes or, if no ice is available, at terrestrial sites. To estimate walrus numbers for the six stocks, aerial surveys of walrus haulouts were conducted between 2007 and 2011. The practice of using haulout counts to estimate stock size for walrus is thought to be an appropriate survey method but is not well developed. For that reason several approaches were used to extract as much information as possible from the data. Data from satellite tags deployed at the time and in the location of some surveys, and from other walrus studies, were used to adjust the haulout counts to account for those animals missed by the survey. A range of abundance estimates were obtained, all of which are considered negatively biased due to incomplete coverage.

Under the precautionary approach, walrus are considered data poor. DFO uses the PBR method to develop advice about sustainable removals for marine mammals considered data poor. PBR refers to all human-caused mortality so estimating a TAR provides the level of removals from all human-caused mortalities that should allow the population to grow. The purpose of this document is to use recent aerial survey information to estimate TARs for walrus stocks using the PBR method.

ASSESSMENT

Published population estimates compiled by Stewart and Hamilton (2013) are presented in Table 1.These data differ among stocks and often between years, limiting the application of a consistent technique to estimate walrus numbers. The basis for all these estimates is a Minimum Counted Population (MCP), obtained by counting walrus in digital images taken during aerial surveys. MCP underestimates true population size as some walrus were not counted either because the survey coverage was incomplete or they were submerged during the survey period. MCP values were adjusted using satellite tag data movement patterns and replicate surveys to account for missed animals (Stewart and Hamilton 2013). For each stock, the adjusted MCP estimates were used for the PBR calculation of annual TAR levels (Table 1). As an initial assessment of sustainability of each stock, the TARs were compared with the most recent landed harvest data for 1985-2010 (Table 2) noting that this does not consider other sources of human-caused mortality. For example, since 2008, industrial development in walrus habitat has increased or is about to increase with concomitant potential for increased human-caused walrus mortality (Stewart et al. 2012). PBR includes, by definition, all anthropogenic mortality (removals). Until information is available on hunting mortality (landed and lost), net entanglements, ship strike mortality and other sources of mortality, it is not possible to apportion TAR to individual activities, such as landed harvest or ship-strikes.

The PBR method is used for data-poor species. The method used to calculate TAR levels for each walrus stock is as follows.

$$TAR = PBR = N_{min} \cdot R_{max} \cdot 0.5 \cdot F_R$$

where: N_{min} is the estimated minimum population size. Estimates of N_{min} were direct counts (MCP) or calculated from the adjusted counts of hauled-out walrus (MCP_{HO}).

R_{max} is the maximum rate of increase for the population.

F_R is a recovery factor with values set to reflect known population status, in order to promote recovery of those populations back to an optimum sustainable population level (Wade and Angliss 1997). For populations not known to have been depleted, the recovery factor is set to 1.

R_{max} was set at 0.07, the value determined for a rapidly growing population of Pacific walrus (*Odobenus rosmarus divergens*) (Stewart and Hamilton 2013). F_R was set at 0.5 unless there was evidence of no decline. For the WJS and PS-LS stocks, Stewart et al. (2013a) found no statistical evidence of decline in walrus numbers between 1977 and the 1990s, and so TAR was also calculated by setting F_R = 1.0 for those stocks (Table 1).

There is insufficient information to adjust the TAR level to account for hunting losses. Therefore, stock-specific TARs were compared with corresponding walrus landings reported between 1985 and 2010 (Table 2) averaged for the years in which at least 75% of the communities involved reported harvest data.

High Arctic Population

Baffin Bay

The BB stock was surveyed in 2009, and estimated to number approximately 1,250 walrus, based on a count of 571 (Table 1). The adjusted MCP estimates were accompanied by information from three tags deployed in West Greenland that travelled to East Ellesmere Island at the time of the survey (Stewart and Hamilton 2013). The resulting TAR level was 10-11 walrus. Partitioning removals amongst the three stocks comprising the high Arctic population is not straightforward since the four communities may harvest from different stocks but harvest is only reported by community. If it is assumed that all walrus harvested by the community of Grise Fiord are from the BB stock, the average landed harvest in the years between 1985 and 2010 was nine (Table 2).

West Jones Sound

The WJS stock was surveyed in 2008, and its abundance estimated at 503 (CV = 0.07) walrus, based on a count of 404 (Table 1), no tag data were available for the survey period. However using the maximum proportion of walrus hauled out (0.74) likely underestimates the actual stock size. The calculated TAR was seven or eight, but increased to 17 when F_R was set to 1.0 (Table 2). The average landed harvest in 1985-2010 was nine walrus, but it is not known whether all of the walrus harvested by Grise Fiord were from the WJS stock (to date only four walrus are on record as having come from that stock (Table 2)).

Table 1. Stock-specific comparisons of TAR estimates developed using four different adjustment protocols. The error term is expressed as the coefficient of variation (CV). Only abundance estimates which exceeded MCP are included. (See Stewart and Hamilton (2013) for additional details including original sources of the abundance estimates.)The unadjusted TAR level was calculated by setting the Maximum Counted Population (MCP) as the N_{min} term, R_{max} = 0.07, and F_R = 0.5. TAR values in parenthesis were calculated using F_R = 1.0 if there was evidence of no population decline. Empty cells indicate the method was not applied or that it produced an estimate smaller than the number of walrus counted (MCP). BC refers to bounded counts.

	Not Adjusted		MCP_{HO}/0.74[a]			MCP_{HO}/% tags dry[b]			MCP_{HO}/$Avg_{time\ dry}$[c]			BC_{HO}/0.74[d]		
Stock(s) & year	**N_{min} = MCP**	**TAR**	**Est (CV)**	**Cal N_{min}**	**TAR**	**Est (CV)**	**Cal N_{min}**	**TAR**	**Est (CV)**	**Cal N_{min}**	**TAR**	**Est (CV)**	**Cal N_{min}**	**TAR**
Baffin Bay 2009	571	**10**				1,251 (1.00)	621	**11**	1,249 (1.12)	585	**10**			
West Jones Sound 2008	404	**7 (14)**	503 (0.07)	474	**8 (17)**								<MCP	
Penny Strait-Lancaster Sound 2009	557	**10 (19)**	727 (0.07)	685	**12 (24)**							661 (2.08)	<MCP	
North and central Foxe Basin 2011	6,043	**106**	8,153 (0.07)	7,687	**135**	13,452[†] (0.43)	9,510	**166**						
Hoare Bay area of Hudson Bay-Davis Strait 2007	1,056	**18**	1,420 (0.07)	1,339	**23**	2,102 (0.58)	1,336	**23**	2,533 (0.17)	2,197	**38**			

[a] Counts adjusted by the maximum proportion of tagged walrus ever recorded hauled out concurrently in other studies.

[b] Counts adjusted using the proportion of functioning satellite tags ‘dry’ at the time of the survey.

[c] Counts adjusted using the average proportion of a day, or proportion of the survey period, that satellite tags registered as ‘dry’.

[d] Counts based on replicate counts adjusted for detection and availability.

[†] This estimate assumes that the tagging data from a single haulout were representative of other haulouts in Foxe Basin, and is based on a count of 4,484. If this assumption is not valid then the best estimate is 10,379 (CV = 0.42) for a TAR of 129.

Table 2. Stock-specific comparisons between the calculated TAR range and average reported landed harvests in Nunavut and Nunavik between 1985 and 2010. (SD = standard deviation)

Population	Stock(s)	TAR Range	Average Annual Landed Harvest ± SD (# years averaged)[†]	Comments
High Arctic		27- 31 (52[‡])	14.1 ± 10.1 (22)	
	Baffin Bay (BB)	10-11	9.0 ± 6.7* (17)	* If all Grise Fiord harvest is from BB.
	West Jones Sound (WJS)	7-8 (to 17 if F_R=1.0)	9.0 ± 6.7* (17)	* If all Grise Fiord harvest is from WJS but only 4 on record.
	Penny Strait-Lancaster Sound (PS-LS)	10-12 (to 24 if F_R=1.0)	5.9 ± 4.3* (17)	* If all Arctic Bay, Pond Inlet & Resolute harvests are from PS-LS.
Central Arctic			366.7 ± 85.5 (18)	
	North and central Foxe Basin (N&C-FB)	106-135 (166)	184.5 ± 56.1 (22)	TAR may be as high as 166 depending on how the tag data are interpreted.
	Hoare Bay area of Hudson Bay-Davis Strait (HB-DS)	18-38	35.8 ± 18.9* (21)	* If all Clyde River, Qikiqtarjuaq, Pangnirtung and Iqaluit harvests are from southeast Baffin Island (Clyde River, Qikiqtarjuaq and Pangnirtung averaged 22 walrus).
	Hudson Bay-Davis Strait (HB-DS)		165.7 ± 65.7 (21)	Requires HB-DS stock have about 9,500 walrus for a TAR of 166.

[†] The average reported harvest includes only years in which at least 75% of walrus-hunting communities reported their catches.

[‡] If F_R=1.0 for WJS and PS-LS.

Penny Strait-Lancaster Sound

In 2009, the PS-LS stock was estimated to number between 661 (CV = 2.08) and 727 (CV = 0.07) walrus, based on a count of 557 (Table 1). No satellite tag data were available for the 2009 surveys, so no specific adjustment factors could be applied. It is likely that, by using the maximum proportion of walrus hauled out (0.74), the actual number of animals is underestimated. The calculated TARs for this stock were 10-12 walrus (Table 2). Calculating TAR with F_R = 1.0, increased the TAR to 24. If it is assumed that all the walrus harvested by the communities of Arctic Bay, Pond Inlet and Resolute are from the PS-LS stock, the average landed harvest for 1985-2010 was six (Table 2).

Population-Level Removals

Although accurate partitioning of harvest to the three stocks was not possible, the combined TAR sum (27-52) exceeds the average reported harvests of 14 walrus for the high Arctic population in Canada (Table 2, Figure 2).

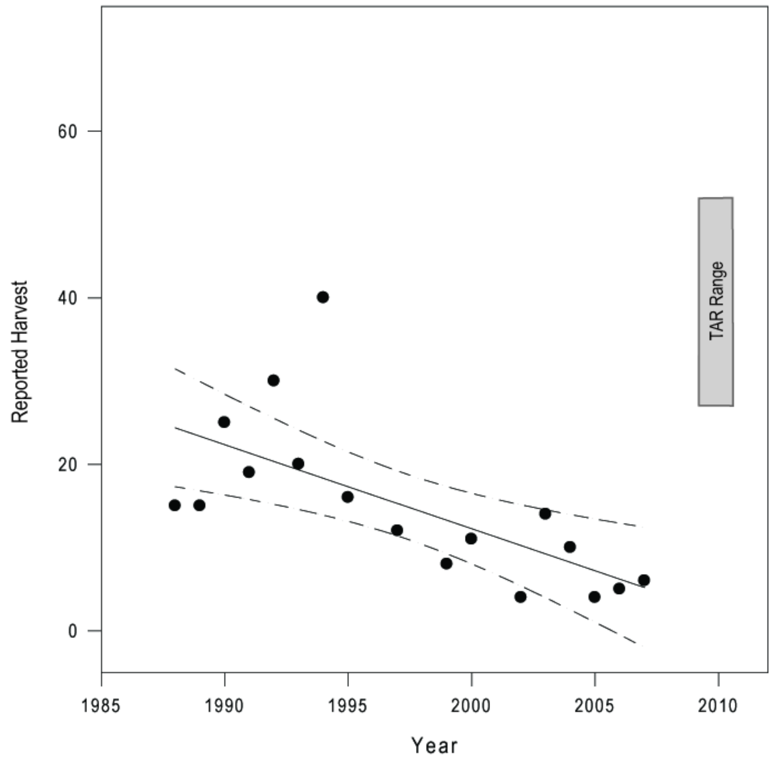

Figure 2. Reported annual harvests from high Arctic communities. Dashed lines are the upper and lower 95% confidence limits around the mean. The estimated TAR range is identified for comparison.

Central Arctic Population

Northern and Central Foxe Basin

Walrus of the N-FB and C-FB stocks are indistinguishable from the air so the survey results are combined and they refer collectively to N&C-FB. This combined stock was estimated to number 8,153 (CV = 0.07) walrus in 2011, based on a count of 6,043 (Table 1) (Stewart et al. 2013b), however assuming the maximum proportion of walrus hauled out (0.74) likely underestimates the actual number of animals present. The PBR calculation yielded TARs of 106-135 walrus which is less than the 25-year average reported harvest of about 185 walrus (Table 2), although it overlaps the lower 95% confidence limit (Figure 3). If it is assumed that data from 12 tags at a single haulout were representative of other haulouts in Foxe Basin, then there may have been 13,452 (CV = 0.43) walrus present and the TAR would be 166. It is not possible to test this assumption with current information. While the reported harvest on the N&C-FB stocks is above the TAR range, it is known that the survey was incomplete in coverage and likely produced an underestimate of abundance for this stock. However, the possible exchange between the N&C-FB and the spatially-larger HB-DS stocks needs further investigation.

Hudson Bay-Davis Strait

Only a small portion of the HB-DS stock range has been surveyed. The numbers of walrus summering in Hoare Bay, on southeast Baffin Island, in 2007 were estimated at between 1,420 (CV=0.07) and 2,533 (0.17). The latter estimate was adjusted using data from four tags deployed there. The PBR calculation for the Hoare Bay area yielded TARs of between 18 and 38 walrus (Table 2). If it is assumed that all the walrus harvested by the communities of Clyde River, Qikiqtarjuaq and Pangnirtung are from the southeast Baffin Island, the average landed harvest for 1985-2010 was 22 (Table 2).When Iqaluit is added, the average landed harvest was about 36 (Table 2).

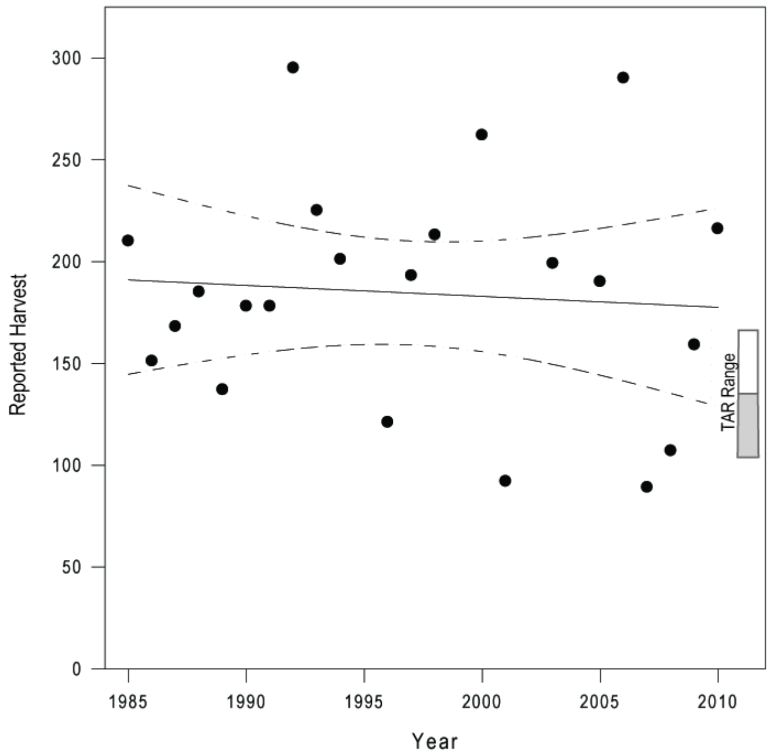

Figure 3. Reported annual harvests from Foxe Basin communities. Dashed lines are the upper and lower 95% confidence limits around the mean. The estimated TAR range is identified for comparison. The grey shaded box is based on surveys in 2010 and 2011. The unshaded box indicates the extended range if tag data were representative.

The annual reported harvest for the HB-DS stock averaged about 166 walrus (Table 2) with a statistically significant decline over the 25-year period (Figure 4). It has been suggested that there may be subunits or clinal variation within the HB-DS stock, but at the present time walrus harvests cannot be assigned to those undefined subunits. A population size of 9,500 walrus is required to support the current level of harvest from the HB-DS stock. This is not inconceivable given the large range of this stock but the entire stock would not be available to support local takes of this magnitude. More information is required on both stock structure and stock size.

Population-Level Removals

Survey coverage of the central Arctic population is largely incomplete, and there is evidence of substantial movement between Canada and Greenland. As such, the available abundance estimate is considered an underestimate for the entire population. There are insufficient data available at this time to improve its accuracy or estimate a population level TAR. The average reported harvest in Canada for the central Arctic population is 367 walrus (Table 2).

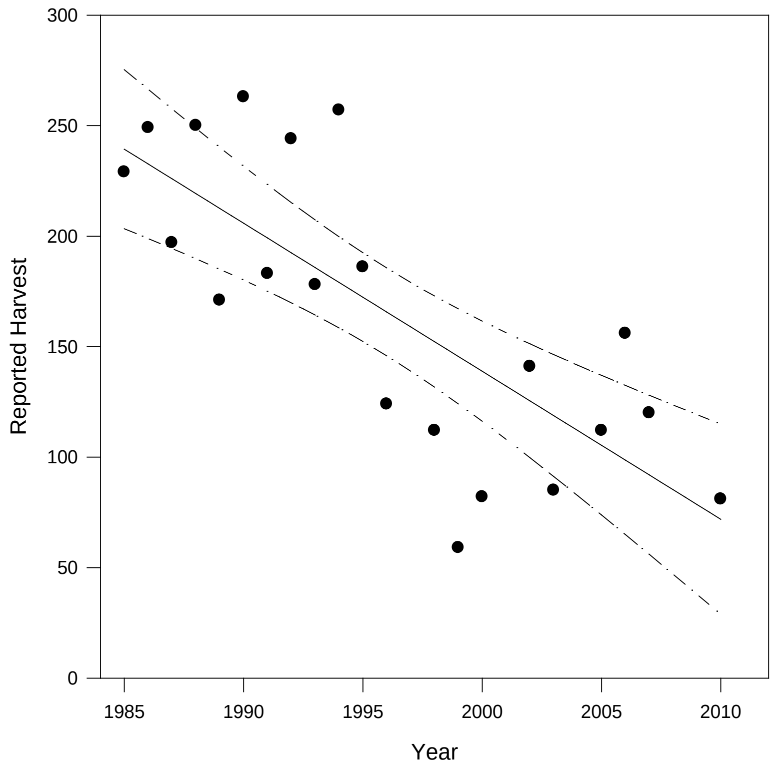

Figure 4. Reported annual harvests from Hudson Bay-Davis Strait communities. Dashed lines are the upper and lower 95% confidence limits around the mean.

Sources of Uncertainty

Walrus are widely distributed, the number of recurring haulout sites is uncertain, and the extent to which walrus move between haulout sites is not known. For these reasons, it is reasonable to assume that aerial survey coverage is incomplete. Comprehensive aerial surveys are also affected by annual variations in weather, ice conditions, and walrus distribution. Disturbance by boat activity at some haulout sites during the surveys caused animals to disperse, which limited the information available for abundance estimation, since displaced animals had the opportunity to travel to other haulout sites between surveys. Current estimates of total stock size are lacking for the HB-DS stock, and little information is available about walrus movements within Foxe Basin and between Foxe Basin and areas of HB-DS.

Information from satellite telemetry studies is used to adjust surface counts for diving/subsurface animals that are not counted during surveys. Many of the abundance estimates reported here relied on correction factors developed from previous studies, because it was not always possible to instrument local walrus at the time of the surveys. Even when concurrent telemetry information is available, the movements of individual walrus may not be representative of the whole stock. The behaviour of tagged walrus can be affected by the timing of their dispersal from the tagging sites and the possibility of coordinated haulout behaviour. Only estimates for Foxe Basin are based on more than 10 tags deployed in the area at the time of the surveys.

Information about levels of human-caused walrus mortality is limited or lacking. Reported harvest levels underestimate numbers of walrus removed, in part because they do not include struck-and-lost rates. Current hunting loss rates for different geographic areas, seasons and hunting methods in Canadian waters are not available. The BB stock and the HB-DS stock are hunted in both Canada and Greenland but the current harvest levels from Greenland are not considered in this report. The relationship of hunted stocks between the two countries is uncertain. Other sources of human-caused mortality (e.g., ship strikes, net entanglements) have not been quantified.

There is no current information on walrus inhabiting S&E-HB to provide an abundance estimate or an understanding of their relationship to the other walrus stocks.

CONCLUSIONS AND ADVICE

There are no immediate concerns about the sustainability of the high Arctic walrus population, however a portion of this population is known to be shared with Greenland. A better understanding of walrus movement patterns and total hunting mortality is required to ascertain the sustainability of the cumulative harvest in both countries.

The central Arctic population as a whole lacks sufficient data for a meaningful population estimate and subsequent advice on TARs. In addition, this population is shared with Greenland, and scientific advice regarding overall sustainability requires more complete harvest information from both countries as well as better understanding of walrus movement patterns.

The PBR method allows estimation of the numbers of walrus than can be removed from the population annually as a result of all human activity without jeopardizing sustainability. Better information is required on current landed harvest levels and hunting losses. Levels of walrus mortality resulting from other human activities (e.g., net entanglements, ship strikes) are unknown yet need to be considered when determining sustainable harvest levels. The estimates of TARs presented cannot be partitioned among various sources of human-caused mortality. For all stocks, additional information about human-caused mortality is required before providing sustainable harvest advice.

Walrus distributions appear to be in a state of flux; changes in ice conditions and weather patterns appear to be altering movement patterns and habitat usage. This in turn may change stock and population dynamics in the future.

MANAGEMENT CONSIDERATIONS

The BB stock and HB-DS stock are shared with Greenland based on evidence from tagging data. Future discussion relating population estimates to harvests should include harvesters from Nunavut, Nunavik, and Greenland. Presently, Canada and Greenland have no shared management officially in place for these stocks. Increased sharing of harvest data between Canada and Greenland is advised, to determine which communities in both countries are hunting walrus and how many are taken from the shared stocks. In addition, continued satellite telemetry and genetics research is needed to determine the relationship of hunted stocks between the two countries. Lastly, other sources of human-caused mortality (e.g., ship strikes, net entanglements) need to be quantified to enable more precise sustainable harvest advice.

SOURCES OF INFORMATION

This Science Advisory Report is from the October 29 to November 2, 2012 annual meeting of the National Marine Mammal Peer Review Committee (NMMPRC). Additional publications from this process will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

Stewart, R.E.A. 2008. Can we calculate total allowable harvests for walrus using potential biological removal? DFO Can. Sci. Adv. Sec. Res Doc. 2008/025. iv + 13 p.

Stewart, R.E.A., and Hamilton, J.W. 2013. Estimating total allowable removals for walrus (*Odobenus rosmarus rosmarus*) in Nunavut using the potential biological removal approach. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/031. iii + 12 p.

Stewart, R.E.A., Lesage, V., Lawson, J.W., Cleator, H., and Martin, K.A. 2012. Science technical review of the draft environmental impact statement (EIS) for Baffinland's Mary River Project. DFO Can. Sci. Advis. Sec. Res. Doc. 2011/086. vi + 62 p.

Stewart, R.E.A., Born, E.W., Dunn, J.B., Koski, W.R., and Ryan, A.K. 2013a.Use of multiple methods to estimate walrus (*Odobenus rosmarus rosmarus*) abundance in the Penny Strait-Lancaster Sound and West Jones Sound stocks, Canada. NAMMCO Sci. Publ. 9.

Stewart, R.E.A., Hamilton, J.W., and Dunn, J.B. 2013. Results of Foxe Basin walrus (*Odobenus rosmarus rosmarus*) surveys: 2010-2011. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/017. iv + 12 p.

Wade, P.R., and Angliss, R.P. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12. 93 p.

THIS REPORT IS AVAILABLE FROM THE:

Centre for Science Advice (CSA)
Central and Arctic Region
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB
R3T 2N6

Telephone: (204) 983-5131
E-Mail: xcna-csa-cas@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087

Correct Citation for this Publication:

DFO. 2013. Estimates of Abundance and Total Allowable Removals for Atlantic Walrus (*Odobenus rosmarus rosmarus*) in the Canadian Arctic. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/034.

Aussi disponible en français :

DFO. 2013. Estimations de l'abondance et du total autorisé de prélèvements de morse de l'Atlantique (Odobenus rosmarus rosmarus) dans l'Arctique canadien. Secr. can. de consult. sci., Avis sci. 2013/034.

Inuktitut Atuinnaummijuq :

ᑐᐧᑌᓵᐧᐋᐧᐅᑯᖓᐳᐧ ᐃᖃᑑᐧᑐᐧᓰᐧᓴᐧᐹᐧᐸᐳᐧ ᐃᑐᑐᐧᓰᐧᓴᐧᐹᐧᐸᑖᐧᑑᐧ 2013. ᓇᓚᐅᑦᑖᖅᑕᐅᓯᒪᓂᖏᑦ ᐊᒥᓲᑎᒋᓂᖏᑦ ᐊᒻᒪᓗ ᑕᒪᕐᒥᒃ ᐱᔭᐅᔪᓐᓇᖅᑎᒋᓂᖏᑦ ᐊᐃᕖᑦ (ᑑᑎᓐᑎᑐᑦ ᐅᖃᐅᓯᒃᓴᐃᑦ ᑕᐃᔭᐅᔪᑦ (*Odobenus rosmarus rosmarus*) ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ. ᑐᐧᑌᓵᐧᐋᐧᐅᑯᖓᐳᐧ ᐃᖃᑑᐧᑐᐧᓰᐧᓴᐧᐹᐧᐸᐳᐧ ᐃᑐᑐᐧᓰᐧᓴᐧᐹᐧᐸᑖᐧᑑᐧ ᐧᐹᐧᑏᐋᐧᑐ ᐱᐧᐴᑕᑐᐧᓯᕋᐧᓯᐴᐧᑎᐳᐧ ᐅᖃᐅᓯᐧᓴᑉᐴᐧᕿᐧᐱᐳᐧ Rep. 2013/034.