

**CIE Peer Review Report  
The Status of the Cook Inlet, Alaska, Beluga Population**

**by**

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## **I. Executive Summary**

There has been a thorough review of the biological and population data available for Cook Inlet beluga whales. Essential habitat features are not well understood and little information exists on the behaviour of Cook Inlet belugas. Mortality from stranding and killer whale predation are the two most important sources of natural mortality, but the causes or factors involved are not well documented.

Modelling to estimate extinction risk in this population is a valid exercise given the limited opportunities for long term monitoring and the small remaining number of belugas in Cook Inlet. The stochastic structure of the model along with age specific population parameters are of sufficient detail to provide realistic predictions for the population viability assessment.

The model uses reasonable ranges of population parameters for belugas and up to date information on their abundance in Cook Inlet and mortality to calculate extinction risk. The density dependent mechanisms in the model are entirely realistic.

The review and inclusion of knowledge relating to the Cook Inlet population and adjacent Alaskan populations is complete and appropriately considered in the analysis. Little is said of analogous situations, such as the depleted beluga stocks in Canada, which might lend further insights relating to extinction or recovery scenarios.

The model has density dependent mechanisms and assumed periodic mortality rates, which adequately represent the processes within a population.

The PVA model, based all possible reasonable ranges of population parameters and best estimates of abundance, gives a reasonable, thorough and conservative estimate of extinction risk.

The analysis is valid and supports the conclusion that the Cook Inlet beluga population faces a significant probability of extinction in the next 300 years.

## II. Terms of Reference

1. Evaluate whether the adequacy, appropriateness, and application of data used in the assessment represents the best available science?

The background information on the historic catch levels, the distribution of the belugas in and adjacent to Cook Inlet and the genetic characteristics of the Cook Inlet stock appears to have been covered thoroughly and affirms the view that this is a small, isolated and discreet population.

Habitat quality and the identification of some essential habitat features are only identified by the location of the belugas themselves and not by any independent field studies. Little is known of the behavior of belugas within the areas of their summer aggregation, or on the extent of their dependence on food concentrations. Their diurnal movements are not described.

The identification of factors, such as the risk of entrapments or standings and the possibility of predation from killer whales, points to important sources of significant mortality. Strandings, in particular, could result in significant mortality events if such events were more frequent or became more pronounced because of unforeseen natural or anthropogenic sources of disturbance. To date strandings appear not to result in large casualties, but this could change unpredictably with industrial development of Cook Inlet in the future.

Killer whale mortality set in the range of 1-5 kills per year in the model appears reasonable given the present knowledge, but is based on little actual data. The lower bounds might be underestimated.

Essentially the quantitative models used in the assessments are dependent mainly on estimates of abundance from the aerial surveys conducted by NMML from 1994 to 2006 and on population parameters gleaned from other population studies of beluga populations.

The method of whole counts of belugas used in the aerial surveys was appropriate for this confined stock and the coverage of Cook Inlet adequate to assure that the complete seasonally and annually occupied area was covered during the early summer surveys. The method used to correct for animals missed by the observers (using zoomed video records) and for correcting for whales, which were underwater, was appropriate.

The range of populations parameters (birth and survivorship rates) used in the models is reasonable. Birth rates are derived from life tables in other studies. The survivorship (97% for adults) for adults based on carcasses of belugas found on the beaches of Cook Inlet (12 on the period of 1999 to 2005) might be an overestimate. This however would err on the conservative side in the estimate of extinction risk. The age of sexual maturity, birth interval and period of calf dependency all gleaned from other studies are used appropriately in the models.

2. Evaluate whether the adequacy, appropriateness, and application of analytical methods and modeling represents the best available science?

The opportunity to conduct long term studies of a harvested beluga population, where population parameters from aged specimens are available, does not exist in the case of the Cook Inlet belugas. Also, the logistic difficulties imposed by the conditions in the Inlet and conservation constraints on such “hands-on” approaches as captures and tagging over a long period of time point directly to the necessity of using a modelling approach to evaluate the status of what by all measures appears to be a fragile population

The population viability assessment models (PVA) used in this study (Hobbs *et al* 2006 and Wade 2007) were structured appropriately to investigate the growth rate of a recently heavily harvested beluga population. The assumption that this population had something resembling a stable age structure was needed for the models, but might not have been the case. Nonetheless the models do account for the effect of a large (actual) harvest during the years 1994 to 1999, which would in turn shape the age structure appropriately.

The two models were similar in their structure with slight differences in the input (age structure and sex composition of the harvest and survivorship of the juvenile age classes). The Wade 2007 model used a different mechanism to calculate the Allee effect on the small population. The results of the simulations from both models were similar. The Wade model serves essentially to verify the results of the Hobbs *et al* 2006 model.

The comments to follow in this assessment pertain to the Hobbs *et al* 2006 model since it is the more detailed of the two models. This model accounted for unequal harvests of male and females based on actual data from carcasses retrieved in Cook Inlet. The authors also took into account the number of whales which could have died but were not retrieved (struck and lost).

CIE Peer Review Report  
The Status of the Cook Inlet, Alaska, Beluga Population

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The risk assessment based on a population of 500 or less belugas in the population reflects the actual Cook Inlet situation and is considered a reasonable approach. The range of the population parameters used in the model is based on the best available data from other studies and data gathered during the harvest of the 1990's in Cook Inlet.

3. Do the biological data, population data, model structure and assumptions, and the analysis methods applied to the extinction risk assessment represent the best available data and methodology for sound science?

The methodology applied to extinction risk assessment uses realistic ranges in the best available population parameters for beluga population. The use of stochastic simulations combined with a reasonable density dependent mechanism acting on both birth and survivorship rates provides for a realistic assessment of the risk of extinction over a period of up to 300 years.

The model is based on the best available data of the abundance of belugas in Cook Inlet and thus is the appropriate departure point for the modelling exercise. Constant mortality from a reasonable range of killer whale annual kills and a stochastically structured periodic unusual mortality event, are entirely reasonable assumptions and appropriately used in the model.

4. Does the status review provide an adequate assessment of the current knowledge regarding the biology of belugas in general and the Cook Inlet beluga population in particular? Comment on the strengths and weakness of the status review in regard to this question.

The review of the knowledge relating to the Cook Inlet belugas in particular is thorough and appears to have covered all available sources including the local traditional knowledge held by the native harvesters. Additional related knowledge from adjacent Alaskan and some Canadian populations on age specific population parameters is also well covered.

Little mention is made of analogous situations in Canada where at least three of the seven populations of belugas have been severely depleted by over-harvesting, and where continuing studies are attempting to monitor their status or predict their risk of extinction. One of these is the isolated beluga population, which inhabits the St. Lawrence River. The experience there is possibly very similar to that of Cook Inlet with a population that was reduced by harvesting and

CIE Peer Review Report  
The Status of the Cook Inlet, Alaska, Beluga Population

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bounty hunting to as low as 300-500 animals from a stock (stocks?) that might have been as high as 3000 to 5000 in numbers. Hunting ceased there in the mid 70's and the population has increased, but appears to have stalled at some 1000-1300 individuals. Population modelling has also been done on the Eastern Hudson Bay stock, which numbers some 1200 to 1400 animals, and continues to be harvested.

Some additional data useful to the Cook Inlet beluga assessment might be available on the age structure, birth or survivorship rates of these depleted populations, which could be of some use as inputs in a more detailed age structured model of Cook Inlet if this was deemed necessary in the future.

A thorough review of the knowledge and current status of the Canadian beluga populations is available at:

[www.sararegistry.gc.ca/virtual\\_sara/files/cosewic\\_beluga\\_whale\\_e.pdf](http://www.sararegistry.gc.ca/virtual_sara/files/cosewic_beluga_whale_e.pdf)

5. Do the population models adequately represent the processes within the population? Comment on the strengths and weakness of the models in regard to this question?

The model gives proper weight to the density dependent processes within the population. The Allee effect is structured to influence the population when it reaches very low numbers, which is realistic given the confined and tight geographic distribution of the Cook Inlet. The range of constant mortality effects and density dependence of a range of birth rates and survivorship rates resulted in realistic extinction risk scenarios.

6. Are the analysis methods valid and sufficient to estimate the extinction risk? Comment on the strengths and weakness of the analysis methods in regard to this question.

The PVA model, with its realistic range of biological parameters and the initial age structure shaped by the removals from the population between 1994-1999, gives realistic results in the assessment of risk of extinction for the Cook Inlet beluga population. It is felt that all possible realistic combinations of population parameters and mortality factors have been examined in a reasonable, thorough and conservative manner.

7. Are the analysis methods valid and sufficient to estimate the extinction risk? Comment on the strengths and weakness of the analysis methods in regard to this question.

The conclusion, that the Cook Inlet beluga population has a significant probability of continuing to decline or become extinct in the next 300 years, is supported by the data and the processes of the model. The statement that this might be prevented by altering the factors in favor of population growth or survival, begs the question of "*what these factors might be?*"

**Appendix I: Background material**

Hobbs, R.C., K.E.W. Shelden, D.J. Vos, K.T. Goetz, and D.J. Rugh. 2006. Status review and extinction assessment of Cook Inlet belugas (*Delphinapterus leucas*). AFSC Processed Rep. 2006-16, 74p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Wade, Paul R. 2007. Population viability analysis of the beluga whale population (*Delphinapterus leucas*) in Cook Inlet, Alaska. Unpublished MS, Alaska Fish. Sci. Cent. NOAA, Natl. Mar. Fish. Serv. 7600 Sand Point Way, Seattle WA 98115.

**Appendix II: Statement of Work**

**Consulting Agreement between NTVI and Dr. Tom Smith**

October 17, 2007

**Statement of Work**

**Overview**

The National Marine Mammal Laboratory (NMML) of the Alaska Fisheries Science Center (AFSC) requires an independent review of scientific documents, analysis, and the resulting conclusions which support the proposed listing of the Cook Inlet beluga (CIB) as endangered under the Endangered Species Act. Specifically, a review of the background biological data, population data, model structure and assumptions and the analysis methods applied to the extinction risk assessment and the conclusions resulting from that assessment. A revised and updated status review will be published in February 2008 as an AFSC processed report. This revised status review will address scientific issues raised during the public comment period (that closed on August 3, 2007) and update the November 2006 report, Status Review and Extinction Assessment of Cook Inlet Belugas, to account for scientific data and other information that has become available in the interim including abundance estimates from 2006 and 2007. The recommendations from the peer review, including updated and auxiliary analysis, will be addressed in the final revisions prior to publication of the status review in February 2008.

The requested peer review will be conducted by four appointed reviewers from the Center for Independent Experts (CIE), one of which will be selected as the CIE chair for the panel review meeting. The panel will convene at the NMML in Seattle, Washington during November 13-16, 2007 to review the extinction risk assessment for CIB according to the Terms of Reference specified herein. Each reviewer will be provided with the report on Status Review and Extinction Assessment of Cook Inlet Belugas and other documents for review prior to the panel review meeting scheduled in Seattle during November 13-16, 2007. The three independent CIE reviewers and CIE chair will participate during the panel review meeting and provide their peer review reports as stated in the Terms of Reference and Schedule specified herein. The CIE reviewer's primary responsibility is to determine whether the best available science has been

utilized, and to provide recommendations for improving the science for the Status Review and Extinction Assessment of Cook Inlet Belugas.

## **CIE Reviewer Responsibilities**

The CIE's deliverables shall be provided according to the schedule of milestones listed below in this statement of work. Three CIE reviewers shall review and provide an independent peer review each, and the CIE chairperson will provide a summary report. CIE reviewers will review material provided before the panel review meeting, attend the panel review meeting, and prepare final reports according to the schedule outlined below. The three independent CIE peer review reports and the CIE chair's summary report shall be an accurate representation of the discussions, conclusions and recommendations from the review process.

The three independent CIE reviewers' duties shall occupy a maximum of 14 days per person (i.e., several days prior to the meeting for document review; travel and participation at the panel review meeting in Seattle; and preparation of their review reports after the meeting according to the schedule specified below in this statement of work). The CIE chair's duties shall occupy a maximum of 16 days (i.e., the same schedule as above with the addition of two days to finalize the summary report).

## **Pre-meeting Documents for CIE Peer Review**

The CIE review panel, consisting of three independent CIE reviewers and one CIE chair, shall conduct a peer-review of the following three manuscripts:

1. Status Review and Extinction Assessment of Cook Inlet Belugas, November 2006.
2. Revised and updated model result tables of the existing model in the status review by Dr. Rod Hobbs including the abundance estimate for 2006, available by October 30, 2007.
3. Report on an alternative model by Dr. Paul Wade, available October 30, 2007.

The CIE reviewers are not responsible for any of the above mentioned reports that are distributed to them later than November 2, 2007.

*NMML Contact person for pre-meeting review material:*

Dr. Roderick Hobbs, email: Rod.Hobbs@noaa.gov, telephone: (206) 526-6278

### **Terms of Reference for CIE Peer Review**

The CIE reviewers shall conduct a peer review of the pre-meeting documents specified above, participate during the panel review meeting, and complete their CIE reports according to the Terms of Reference as stated below:

1. Evaluate whether the adequacy, appropriateness, and application of data used in the assessment represents the best available science.
2. Evaluate whether the adequacy, appropriateness, and application of analytical methods and modeling represents the best available science.
3. Do the biological data, population data, model structure and assumptions, and the analysis methods applied to the extinction risk assessment represent the best available data and methodology for sound science?
4. Does the status review provide an adequate assessment of the current knowledge regarding the biology of belugas in general and the Cook Inlet beluga population in particular? Comment on the strengths and weakness of the status review in regard to this question.
5. Do the population models adequately represent the processes within the population? Comment on the strengths and weakness of the models in regard to this question.
6. Are the analysis methods valid and sufficient to estimate the extinction risk? Comment on the strengths and weakness of the analysis methods in regard to this question.
7. Are the conclusions of the status review supported by the scientific information presented?

The CIE panel should evaluate and indicate as to whether the presented models, analysis, and conclusions are the best available science at this time. The CIE reviewers shall not provide specific management advice. If the panel rejects the models or any components, analysis, results or conclusions, the panel should explain the rejection and provide recommendations for suitable alternatives. According to the schedule outlined below, three CIE reviewers shall submit independent peer review reports and the fourth CIE reviewer acting as Chair during the panel review meeting shall submit a peer review summary report.

## **Review Panel Meeting Supplementary Instructions for CIE Reviewers**

### **(1) Prior to the meeting**

CIE reviewers shall review the three documents (specified above) and any other supporting documents, background documents or reference documents provided before November 2, 2007. It is permissible to request additional information if it is needed to clarify or provide further background.

### **(2) During the panel meeting**

The CIE reviewers shall participate during the panel review meeting and conduct their peer review according to the above Terms of Reference. Three of the CIE reviewers shall provide independent peer reviews, while the fourth CIE reviewer appointed as Chair for the panel review meeting shall provide a peer review summary report. The CIE Chair's duties shall include guidance of the meeting, coordination of presentations and discussion, and facilitation of discussions making sure each Term of Reference is addressed. It is permissible to request additional materials from the authors, if it is deemed necessary to accomplish the goals of the peer review.

The CIE panel, lead by the CIE chair, will then work through the documents provided and discuss the comments of each reviewer and the points in the documents to complete the review. It is anticipated that the peer review can be completed during the three day panel review meeting, providing the fourth day to complete the draft reports.

### **(3) After the Panel Review meeting**

After the panel meeting, the CIE independent reviewers are responsible for completing their independent peer-review reports with submission of the reports to the CIE program manager according to the schedule specified in

CIE Peer Review Report  
The Status of the Cook Inlet, Alaska, Beluga Population

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the following table. The draft CIE reports will be sent to the CIE Chair who will compile a concise summary report for submission to CIE according the schedule specified below. The CIE reports shall be reviewed by the CIE Steering Committee and forwarded to the COTR at the NMFS Office of Science and Technology for approval according to the schedule specified below.

## Schedule

The milestones and schedule are summarized in the table below.

<b>Milestone</b>	<b>Date</b>
Pre-meeting documents provided to CIE reviewers no later than	November 2, 2007
CIE reviewers participate during panel review meeting in Seattle WA	November 13-16
CIE independent peer review reports provided to CIE and Chair	November 30
CIE Chair's summary report provided to CIE	December 12
Final CIE reports provided to COTR	December 21
Final CIE reports approved and distributed by COTR to NMML	January 4, 2008

Upon approval of final CIE independent peer-review reports by the COTR, the reports will be distributed to the NMML. The NMML will utilize the reports for updating the revised status review as part of the document package presented for the evaluation of the proposed listing of the CIB as endangered under the ESA.

## Submission and Acceptance of CIE Reports

According to the schedule and deadline outline above, the CIE shall provide via e-mail the final CIE independent peer review reports and the CIE chair's summary report to the COTR William Michaels ([William.Michaels@noaa.gov](mailto:William.Michaels@noaa.gov)) at NOAA Fisheries. The COTR and alternate COTR Dr. Stephen K. Brown ([Stephen.K.Brown@noaa.gov](mailto:Stephen.K.Brown@noaa.gov)) will review the CIE reports to determine that the Terms of Reference are met, notify the CIE program manager via e-mail regarding acceptance of the reports, and then distribute the reports to the NMML contact person.

CIE Peer Review Report  
The Status of the Cook Inlet, Alaska, Beluga Population

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**Review of Extinction Risk Assessment for Cook Inlet Beluga**  
Tentative Agenda (Seattle, WA, 13-16 November 2007):

Tuesday November 13

9:00 Introductions, Review Terms of Reference                      Coordinator, R. Hobbs

Break

10:30 -12:00 Closed session Panel discussions                      CIE Chair

12:00-13:30 Lunch

13:30-15:00 Hobbs presentation and Q&A session on PVA model                      CIE Chair.

Break

15:30-17:30 Further discussion on PVA model                      CIE Chair

Wednesday November 14

9:00-10:30 Wade presentation and Q&A session on Alternative model                      CIE Chair.

Break

11:00 -12:00 Further discussion on Alternative Model                      CIE Chair

12:00-13:30 Lunch

13:30-17:30 Other requested presentation and Q&A session                      CIE Chair

Break as needed

Thursday November 15

9:00-17:30 Summary discussions or Closed session at discretion of panel.                      CIE Chair  
Report preparation. Break as needed

Friday November 16

9:00-17:30 Report preparation at discretion of panel. Break as needed                      CIE Chair

Page 14 of 16

**ANNEX 1:**

**Contents of CIE Independent Peer Review Reports**

I. Executive Summary

*An abstract of the independent peer review report.*

II. Terms of Reference

*List each Term of Reference, and include a clear statement indicating whether or not the criteria in each element of the Terms of Reference are satisfied.*

III. Peer Review Findings

*Independent peer review findings for each criteria of the Terms of Reference, including recommendations for improvement.*

IV. Further Analyses and Evaluations

*Analytical requests not previously addressed in TOR discussion above.*

VI. Additional Comments

*Provide a summary of any additional discussions not captured in the Terms of Reference statements.*

V. Recommendations

*Provide an independent statement as to whether the best available science was utilized in regard to each of the Term of Reference criteria, including suggestions to improve the Status Review and Extinction Assessment of Cook Inlet Belugas.*

VI. Reviewer Statements

*Each individual reviewer should provide a statement attesting whether or not the contents of the Independent Peer Review Report provide an accurate and complete independent summary of their views on the issues covered in the review. Reviewers may also make any additional individual comments or suggestions desired.*

**ANNEX 2:**

**Contents of CIE Chair's Summary Peer Review Report**

I. Executive Summary

*An abstract of the summary peer review report.*

II. Terms of Reference

*List each Term of Reference, and include a concise summary from the panel review discussions and independent CIE reports indicating whether or not the criteria in each element of the Term of Reference are satisfied.*

III. Peer Review Findings

*Concise summary of peer review findings from the panel review discussions and independent CIE summary reports for each criteria of the Term of Reference, including recommendations for improvement.*

IV.. Further Analyses and Evaluations

*Summary of analytical requests not previously addressed in TOR discussion above.*

IV. Additional Comments

*Provide a summary of any additional discussions not captured in the Terms of Reference statements.*

V. Recommendations

*Provide a summary statement as to whether the best available science was utilized in regard to each of the Term of Reference criteria, including suggestions to improve the Status Review and Extinction Assessment of Cook Inlet Belugas.*

VI. Reviewer Statements

*Provide a statement attesting whether or not the contents of the Summary Peer Review Report provide an accurate and concise summary of the panel review discussions and independent reviewer's reviews on the issues covered in the review. Reviewer may also make any additional individual comments or suggestions desired.*