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Sub-committees/working group name: ASI

Overview of the Status of Stocks Initiative, and intersessional progress of the group on language, terminology, and website content development.

Frank Cipriano, Kate Wilson, Geof H. Givens

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Frank Cipriano[2], Kate Wilson[3], Geof H. Givens[4]

1. INTRODUCTION TO ASI'S STATUS OF STOCKS INITIATIVE, ITS MOTIVATION AND HISTORY

1.1 Motivation

Assessing the status of cetacean populations (a carefully conducted review of abundance and trend, including consideration of biological parameters, human-induced mortality levels, evidence for genetic, morphological and acoustic distinctiveness, movements and mixing, interbreeding and migratory interchange, and other factors) is one of the core activities of the IWC Scientific Committee (SC), and is specifically mandated by the Commission and the ICRW (IWC 1946). A recent initiative, paralleling the efforts of several other SC subcommittees and working groups, has been a new focus on communicating about this work in a form more accessible to non-scientists, the general public, and the Commission. Work on this project began in 2017 within the Standing Working Group on Abundance Estimates, Stock Status and International Cruises (ASI), and is summarised in IWC (2018; 2020; 2021; 2022; 2023). Originally planned as a biennially-updated document, a set of website pages was considered more broadly useful and more practical in recent Committee discussions, and ASI and associated intersessional correspondence groups (ICGs) have begun developing templates and examples for addition to the IWC website (www.iwc.int). This project is called the Status of Stocks Initiative (SOSI).

The aim of SOSI is primarily to summarise completed Committee work for the website, the Commission, and the public (IWC 2023, pg 236), but also to provide information on how such assessments are conducted by the Scientific Committee, with both methodology and results provided at increasing levels of detail up to that which may be useful for informing interested scientists including SC members (IWC 2023, pg 237). The Committee has agreed that SOSI has the potential to provide an excellent extension of the existing IWC website, facilitating communication of some of the IWC's core work and helping to answer one of the most common questions about whales posed to the IWC by the concerned public (IWC 2023, pg 83). The Committee additionally recognised that provision of information on the status of stocks to the Commission and the general public was a priority (IWC 2023, pg. 87).

The goal of the proposed Status of Stocks website is not to replace or contradict existing IWC web pages (nor to second-guess the IUCN Red List). Instead, the SC wishes to highlight its expert computer modeling work, which provides a quantitative view of status of a different character than is provided elsewhere. Specifically, the SC intends that the information provided in the Status of Stocks website should be based on the stock assessment modeling work done for a wide range of the SC's activities, including in-depth assessments, AWMP and RMP

[1] This paper is provided on behalf of the Content Development ICG (full list of members in Acknowledgements section below) but unfortunately there was insufficient time for members to review this text. We apologize for any errors or omissions.

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development, some *Implementation Reviews*, etc. The SC must also consider, however, whether it wishes to include information on stocks not assessed via population modeling, and if so, what sort of information to provide. To facilitate that discussion, we included examples for several such cases in the proposal below.

This paper has two primary purposes: (1) to inform SC members on the background of the project and progress to date, and (2) to present new recommendations on new and revised SOSI content. Discussion of SOSI is best facilitated by viewing the draft content. There are two ways to do this. Draft webpages developed previously and updated here are presented on paper, and have a header including the word 'example'. Some of these prototypes have been converted into actual webpages by a Secretariat team, and are displayed as screen captures here, with a header including the words 'mockup link'. These draft webpages are not yet accessible from menus on the IWC website, but we provide URL links to the hidden pages (click on the blue text 'mockup link' headers) so that interested SC members can open the page and see what it looks like on-screen. All the mockup pages can also be accessed from links at the bottom of the leading mockup page, available at iwc.int/html_731. It is important to stress that much of the content shown is provisional, or place-holding, as final content is not yet agreed. This is explained in more detail below.

1.2 History of SOSI

ASI began work on SOSI in 2017, with steady progress summarised in the annual SC reports IWC (2018; 2020; 2021; 2022; 2023). In 2022, Givens, Punt and Allison developed a detailed proposal, summarizing past SOSI work, incorporating feedback and work from ASI and various ICGs, and presenting new methods and examples, which is summarised in the SC68D Report (item 11.5 of IWC 2023, pp. 82-87, pp. 236-240). The proposal (hereafter, 'the GPA proposal') included examples for assessed stocks with full details available, and also for some small, unmodeled populations or data-poor cases that would help to illustrate the issues that would arise with developing status summaries for cases of interest to both the public and the IWC because of significant concerns for their conservation.

The GPA proposal was shared with communications and IT specialists from the Secretariat, who presented several examples, also at the 2022 SC meeting, for how that content could be interwoven with existing IWC website pages. Those examples showed how the GPA proposal could be used to build on the website's existing introductory level information, developing a new sub-section on population status comprising an introduction, background information, and stock assessment pages (IWC 2023, pg 237).

At SC68D, ASI and the SC reiterated their endorsement of SOSI, endorsed much of the GPA proposal, identified a large list of further issues to consider, and established several ICGs to progress the work. This paper reports on the intersessional progress of one such ICG tasked with developing terminology, language, and draft web content. This remit includes consideration of how assessment results are presented, quantitatively and qualitatively, developing clear text at the introductory level, explaining a variety of concepts important for assessment modelling relative to carrying capacity or other reference levels; the notion of populations, stocks, or other biological 'units' subject to management; the principle of scientific uncertainty; and related terms and concepts. Hereafter we refer to this SOSI ICG as 'the Content Development ICG'. Our ICG was very active intersessionally, including four virtual meetings where a wide variety of recommendations were agreed.

In this document, on behalf of the Content Development ICG, we present the latest proposal for a Status of Stocks website. Some intersessional feedback could not be incorporated in this document (e.g., suggestions to change the specifications for model results after model computations had already been completed). Therefore, this document includes notes for unresolved comments, along with detailed commentary (in blue boxes), not intended for website publication. For those already familiar with the background and examples already developed, the final section of this report ("3. **RESULTS OF THE CONTENT DEVELOPMENT ICG DISCUSSIONS ON OUTSTANDING ISSUES**", hereafter, 'Section 3') includes recommendations pertaining to outstanding issues and options, which will serve as a guide for discussion of the current proposal at SC69A. If the reader does not need a refresher about SOSI content and design, s/he can skip straight to Section 3.

2. STATUS OF STOCKS WEBPAGE NAMES AND CONTENT OVERVIEW

Most of the content and design in this section has been previously agreed by the SC. Some choices remain, which we indicate here and in Section 3. Also, some of the content presented here is simply a place-holder where the SC has agreed the content in principle but has not yet drafted the verbiage.

Many terms, descriptors and page names used by ASI in discussions are IWC-specific jargon, technical terms unfamiliar to the general public, or informal names for proposed Status of Stocks webpages – the name Status of Stocks itself being one example. Many technical terms are not widely used or understood outside the IWC and other Fisheries Management Organizations (FMOs). To avoid confusion, misinterpretation, and ambiguities these will be replaced with more appropriate terms (some with links to definitions and explanatory text) and page names in public-facing Status of Stocks webpages within www.iwc.int. The Secretariat has also been working with provisional terms and page names.

The SOSI web pages broadly follow the IWC's website strategy of designing three levels of detail. Kate Wilson (IWC Secretariat Communications Officer) described this approach to ASI as follows: 'All topics offer introductory level text written in accessible language, with strong supporting images. On many pages, this introductory information links to second level text with additional detail and more technical language. A third 'practitioner' level is used to provide more information and links to source documents such as workshop reports or Commission Resolutions.' We refer to these additional detail pop-ups or pages as 'level two' and 'level three' below.

The webpages proposed over the course of several SC meetings in ASI and in the GPA proposal envisaged five different components, with increasing level of detail on population status from a general and mainly graphical summary to full details of model specifications and results plus background and explanatory information.

Status of Stocks webpages in the GPA proposal

1. *Welcome* page – single webpage for all species and stocks, containing some very brief introductory text and a graphical table divided into sections by species name, species image, with a separate row for each assessed stock, showing the following: stock name, relative abundance thermometer figure, 20 year change thermometer figure, link to *Stock Status Summary* page
2. *Stock Status Summary* page - separate page for each assessed species summarizing the status assessment results for stocks of interest at an introductory level.

3. *Status Details* page - separate page for each assessed species, providing more technical details about how the information on the *Stock Status Summary* page was developed (potentially provided as a downloadable pdf).
4. *Abundance* page – proposed as a link to the IWC's existing webpage on whale abundance, and possibly including a link to the Scientific Committee's *Consolidated Table of Agreed Abundance Estimates* (which currently is not available online).
5. *Methods Document(s)* - a more technical page or pdf document that would describe the assessment modeling approaches, statistics and analysis methods, and rating system used in the above pages for categorizing recovery status and recent growth. The *Methods Document* would comprehensively summarize the SC and ASI reports where our methods for this project have been developed. It would not refer to any particular stock or species.
6. *Glossary and Terminology Page* - Technical terms used on the other pages could be linked to a separate *Glossary and Terminology* page with brief definitions and links to e.g., other terms in the glossary, the *Methods* page, 'Further Reading', and perhaps for some (following the three-level www.iwc.int model) brief 'level two or three' essays on the significance of such terms and their relationship(s) in the IWC and broader contexts.

Based on the above GPA proposal, Secretariat staff developed sample mockup webpages to be accessed via the 'About Whales' pull-down menu in the 'Population Status' section of www.iwc.int .

Secretariat's mockup web pages – click on titles to view

Main pages (these two pages to both appear in the main 'About Whales' pulldown menu)

1. *Introduction to Population Status* - a revised version of the existing webpage pertaining to population status on www.iwc.int, incorporating much of the introductory material from the top level content of the GPA proposal, and with short summary statements excerpted and presented separately (#3 below)
2. *Population Status Table* - essentially the same as the *Welcome Page* (#1) in the GPA proposal.

Sub -pages (most are not visible in the main 'About Whales' pull-down menu)

3. *Population Status - Summaries* (existing webpage content, excerpted) If this is retained, it will need to be made consistent with all the SOSI material.

4a. *Individual Population Assessment* page (option A) – (example: '*Status of Eastern North Pacific Gray Whales'* mockup) These pages combine information found separately in the *Stock Status Summary* page (#2) and *Status Details* page (#3) from the GPA proposal.

4b. *Individual Population Assessment* page (option B)- (example: '*Status of Bowhead Whales'* mockup) These pages combine graphical table rows from the *Welcome Page* (#1) plus the information provided in the *Stock Status Summary* page (#2) from the GPA proposal. For this approach, the content from the *Status Detail* pages (#3) would need to be provided elsewhere.

5. *Population (Abundance) Estimates* – existing page, same as #4 in the GPA proposal
6. *Further Information & Methodology* page (header: '*Population Status Assessments: Methodology'*) Essentially the same as the *Methods Document* (#5) from the GPA proposal
7. *Glossary and Terminology* page (and/or pop-up boxes for individual word definitions and short terminology explanations) Same as #6 from the GPA proposal; no mockups yet.

The GPA proposal and our new and revised content proposals make no appreciable changes to the mathematical modelling and statistical summary of the assessments that ASI has developed for SOSI in recent years. These technical details are given by (IWC, 2018; 2020; 2021; 2022). The *Welcome Page* / *Population Status Table* aims to provide an overall summary of the status for all assessed stocks that could be understood at a glance without reference to technical detail. This information would be displayed in a tabulated format, displaying simple indicators of the relative depletion (referred to as 'relative abundance' in the proposed website content) and recent population change for each stock or species. Radial colour 'thermometer' graphs indicate (on a

continuous scale) the estimated values and uncertainty ranges for relative abundance and change, which are supplemented by discrete category labels and a brief summary statement.

The *Status Summary Pages* would provide a summary of the status of individual stocks/populations including:

- an image of the species and a map of approximate stock boundaries;
- comments about stock definition;
- information regarding any current or recent exploitation;
- the most recent direct abundance estimate (i.e., from a survey, not an assessment model);
- links to pages on www.iwc.int where additional information about the species can be found;
- a table of pooled assessment results (Relative Abundance and 20-Year Change);
- a trajectory plot, potentially followed by a summary statement on recovery; however, the ASG has noted potential issues with standardising language about recovery across different stocks/populations;
- a list of known threats to the stock;
- a statement about data quality and date of the last update; and finally
- links to more technical details in the corresponding *Status Details Page* and the *Methods Page.*

The most technically detailed level of the Status of Stocks website would be found on the *Status Details* pages. Given the nature of the information required to specify an assessment fully and summarize the results, the *Status Details* pages might be PDFs rather than webpages. *A Status Details* page would contain a description of the trials, MSYR values, stock structure hypotheses, the reference population level (pre-exploitation or current carrying capacity), and more details on the modelling exercise.

The assessment results would be tabled per trial, as well as pooled over all trials in the manner previously agreed by ASI. Citations of published papers and SC documents would be required to explain the assessment framework fully.

The proposed *Methods Document* webpage is also highly technical, explaining the basic principles of assessment modelling; concepts such as carrying capacity and depletion; the Relative Abundance and 20-Year Change statistics used to summarise status in simple terms; how to calculate statistics and combine them over trials; thresholds for categorizing depletion and change, and the labels for those categories. Given the level of detail, the Methods pages might also be better in PDF format.

In the following sections, we provide examples of how these pages would look, and interspersed with that is text describing various recommendations, questions, or suggestions that arose during the intersessional work of the Content Development ICG. The easiest way to view the mockup webpages is online (click on the **blue header text** which is the link to the hidden online pages), however those pages do not include the ICG commentary below.

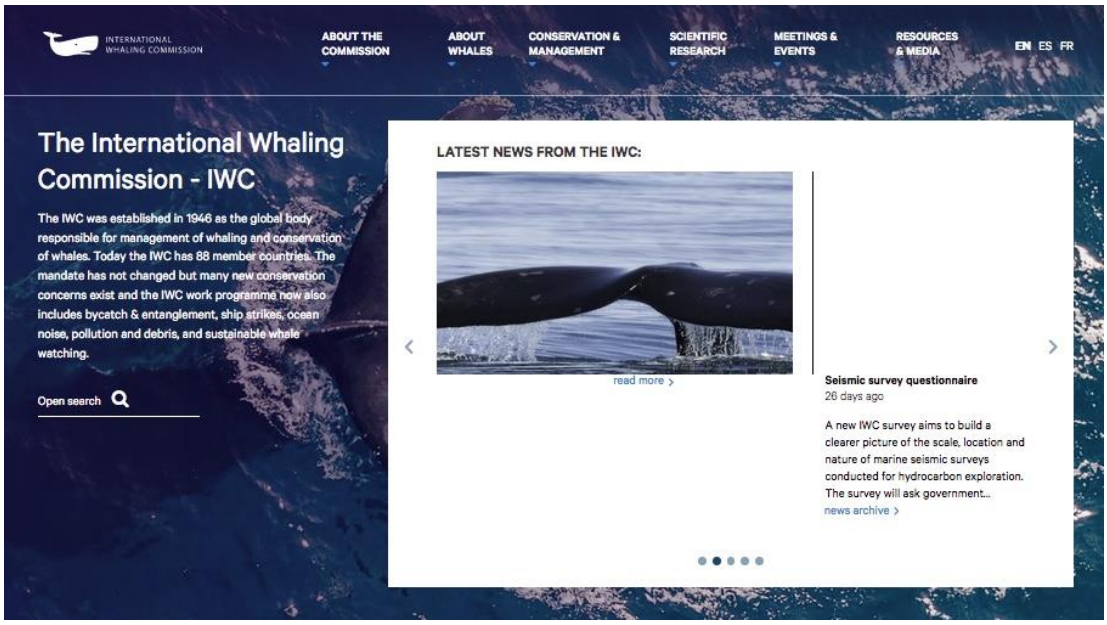
2.1 Webpage components and examples

Below we show various web pages related to designing the Status of Stocks website. Note that the assessment results shown in the examples below are not official SC assessments; they are approximate results generated from available code and reasonable inferences about the precise data, parameters, trials and specifications the SC would need to provide to generate official results. The point is to provide an overall impression of how each page might look. Correct values, from fully specified SC assessments, would replace the results shown here in

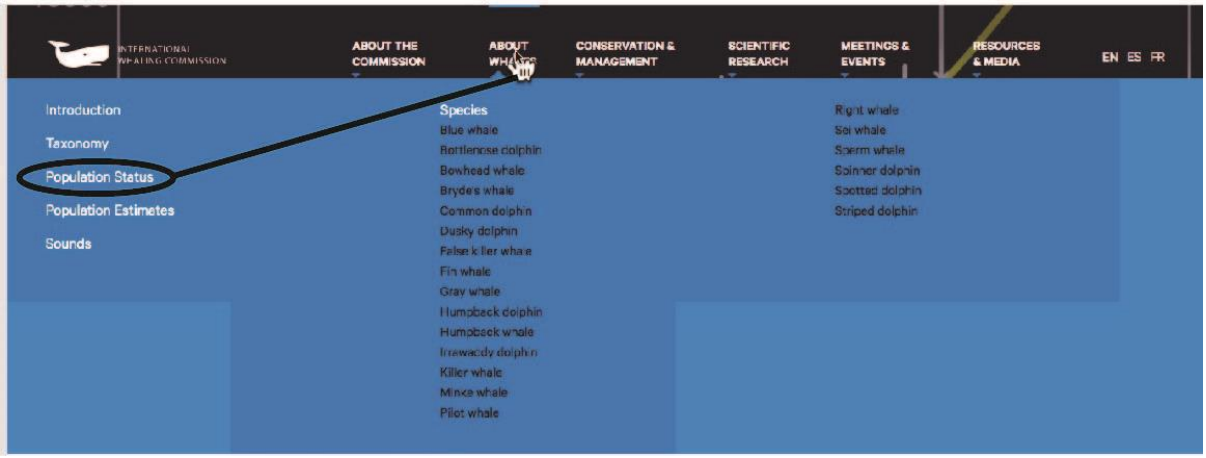
the final website pages. The thermometer code also requires further refinement. For example, the code currently does not cope well when the estimated range is at or beyond the edge of the semicircle. Furthermore, the content below does not reflect all the recent choices ASI has finalized for some statistics, terminology, and format. Finally, it is important to remember that the visual formatting of the Secretariat's draft pages is not finalized. At this point, ASI is working to finalize the content only; the web design will follow when content is done.

2.2 IWC Homepage and Top-Level Menus

The homepage at www.iwc.int has six pull-down menus at the top, and also (not shown) expanded box menus for the same six pull-down items, at the bottom of the page, below a 'latest news' window:



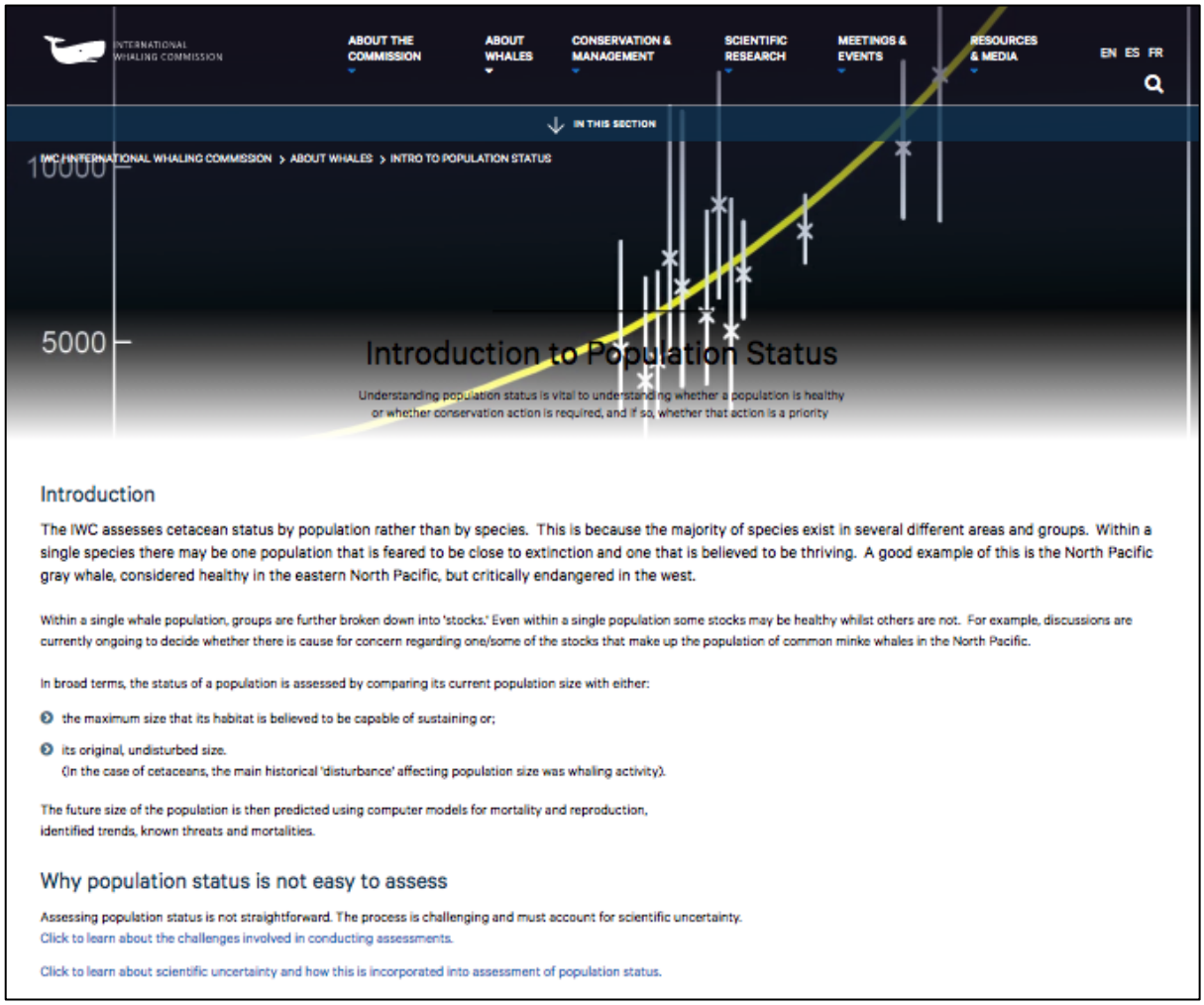
Within the website structure, information about whale species, abundance, population status and structure sits in the 'About Whales' section. The Status of Stocks pages will form a subsection, of the 'About Whales' section, accessible via this pulldown menu. Note that currently the "Population Status" link in the image below still links to the old *Population Status – Short Summaries* page (Secretariat #3 above), not to the new *Introduction to Population Status* content (Secretariat #1 above, see next page).



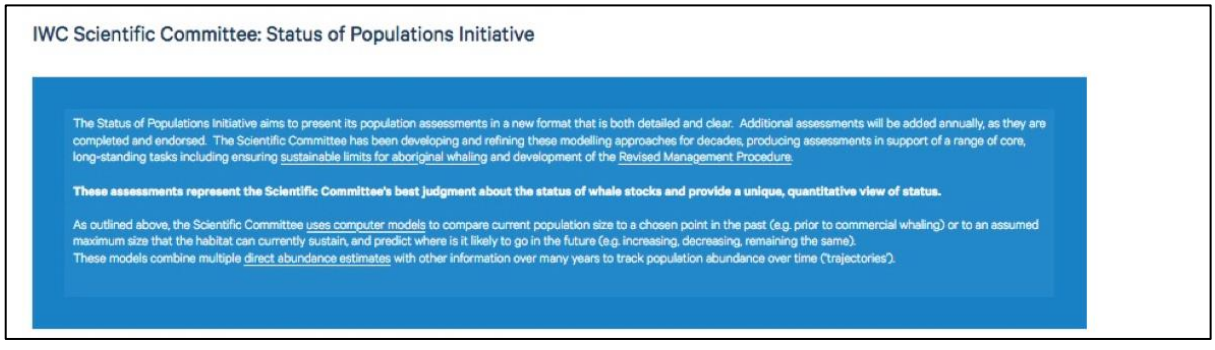
2.3 *Introduction to Population Status* page

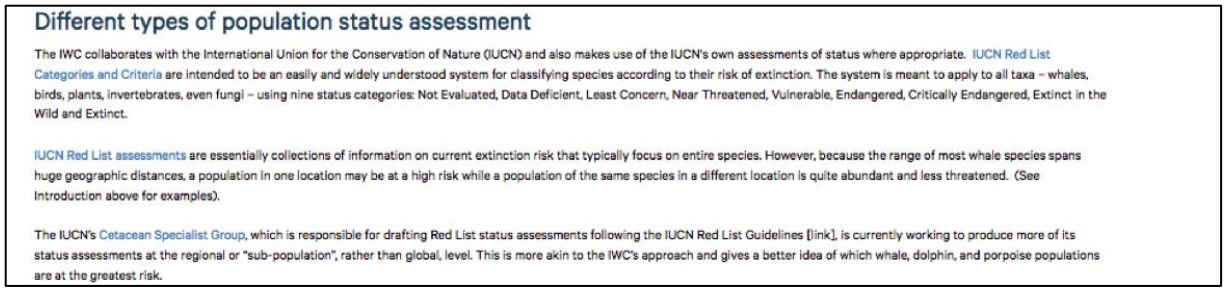
This page was developed by the Secretariat, based on an existing web page on www.iwc.int under the 'About Whales' pulldown menu. This has been suggested as complementary to the Welcome page proposed by ASI.

mockup link: *Introduction to Population Status* page



The mockup page developed by the Secretariat has an additional paragraph on 'Why population status is not easy to assess,' an overview of the Status of Populations initiative, and the paragraph developed with the IUCN/IWC coordination group explaining the differences between IWC Scientific Committee and IUCN Red List assessments. Screenshots of additional draft content are provided below; see also the final section of this paper where the text of each section (in larger type) is presented for further consideration.





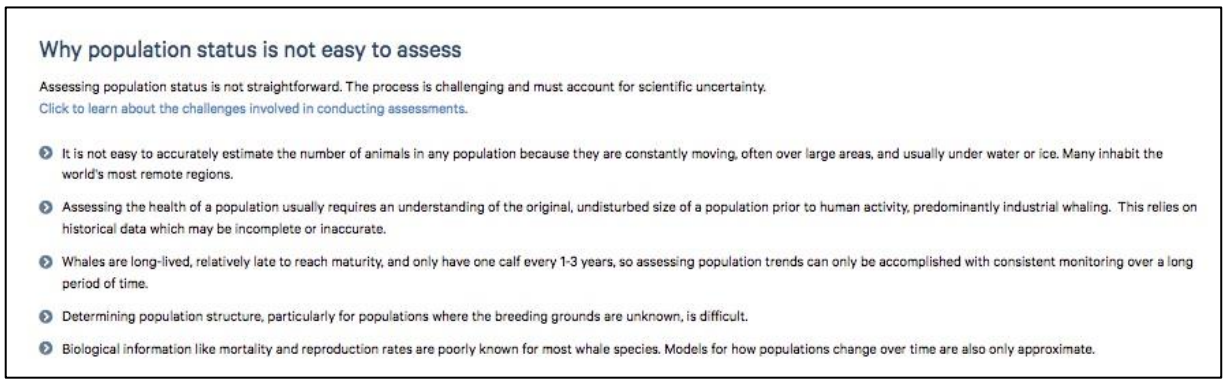
Different types of population status assessment

The IWC collaborates with the International Union for the Conservation of Nature (IUCN) and also makes use of the IUCN's own assessments of status where appropriate. IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species according to their risk of extinction. The system is meant to apply to all taxa – whales, birds, plants, invertebrates, even fungi – using nine status categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct.

IUCN Red List assessments are essentially collections of information on current extinction risk that typically focus on entire species. However, because the range of most whale species spans huge geographic distances, a population in one location may be at a high risk while a population of the same species in a different location is quite abundant and less threatened. (See Introduction above for examples).

The IUCN's Cetacean Specialist Group, which is responsible for drafting Red List status assessments following the IUCN Red List Guidelines [link], is currently working to produce more of its status assessments at the regional or "sub-population", rather than global, level. This is more akin to the IWC's approach and gives a better idea of which whale, dolphin, and porpoise populations are at the greatest risk.

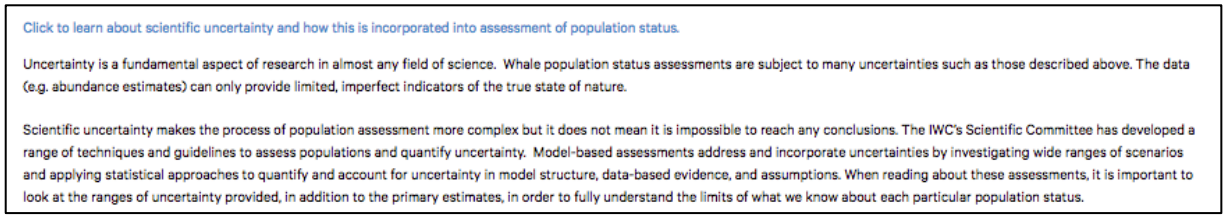
Further information is accessed by clicking on the blue 'click here to learn about…' text:



Why population status is not easy to assess

Assessing population status is not straightforward. The process is challenging and must account for scientific uncertainty.
Click to learn about the challenges involved in conducting assessments.

- It is not easy to accurately estimate the number of animals in any population because they are constantly moving, often over large areas, and usually under water or ice. Many inhabit the world's most remote regions.
- Assessing the health of a population usually requires an understanding of the original, undisturbed size of a population prior to human activity, predominantly industrial whaling. This relies on historical data which may be incomplete or inaccurate.
- Whales are long-lived, relatively late to reach maturity, and only have one calf every 1-3 years, so assessing population trends can only be accomplished with consistent monitoring over a long period of time.
- Determining population structure, particularly for populations where the breeding grounds are unknown, is difficult.
- Biological information like mortality and reproduction rates are poorly known for most whale species. Models for how populations change over time are also only approximate.



Click to learn about scientific uncertainty and how this is incorporated into assessment of population status.

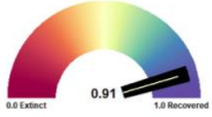
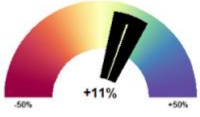
Uncertainty is a fundamental aspect of research in almost any field of science. Whale population status assessments are subject to many uncertainties such as those described above. The data (e.g. abundance estimates) can only provide limited, imperfect indicators of the true state of nature.

Scientific uncertainty makes the process of population assessment more complex but it does not mean it is impossible to reach any conclusions. The IWC's Scientific Committee has developed a range of techniques and guidelines to assess populations and quantify uncertainty. Model-based assessments address and incorporate uncertainties by investigating wide ranges of scenarios and applying statistical approaches to quantify and account for uncertainty in model structure, data-based evidence, and assumptions. When reading about these assessments, it is important to look at the ranges of uncertainty provided, in addition to the primary estimates, in order to fully understand the limits of what we know about each particular population status.

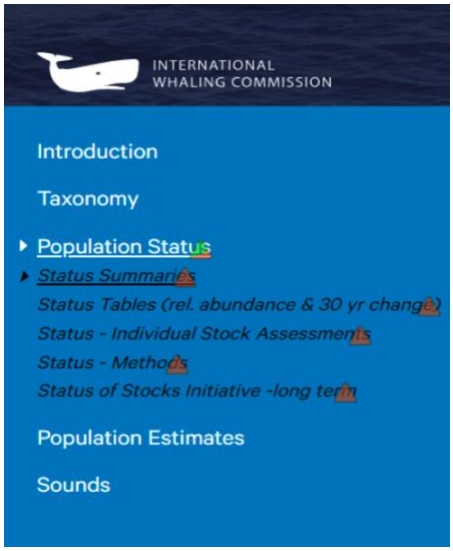
2.4 *Welcome* page

Based on the GPA proposal, ASI developed the *Welcome* page as the initial point of entry to SOSI content on the IWC website. This would be a single webpage for all species and stocks, containing some very brief introductory text and a graphical table divided into sections by species name, species image, with a separate row for each assessed stock, showing the following: stock name, relative abundance thermometer figure, 20-year change thermometer figure, and links to further information. The thermometers were developed in response to ASI's reluctance (in 2021) to rely solely on discrete category labels. They show integrated assessment estimates (with uncertainty) for depletion (labeled 'Relative Abundance') and 20-year cumulative population increase or decrease ('20-Year Change'). Both are based on 1+ abundance.

example: *Welcome* page entry

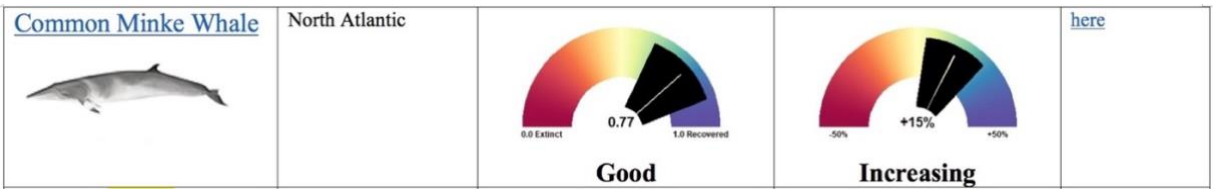
Species	Stock or Area	Relative Abundance	30-Year Change	Status Assessment
Gray Whale 	Eastern North Pacific	 Very Good	 Increasing	here

The proposed 'Introduction to Population Status' mockup shown above could also serve as the entry point to SOSI content pages, and both (or multiple main sections) could be accessed under submenus accessed under the 'About Whales' main menu item on the IWC website, e.g.:



Thus, a choice remains about the content and style of the point-of-entry page to SOSI content, discussed further in Section 3.

example: *Welcome* page entry



The category labels used to classify Relative Abundance were originally proposed (based on 1+ depletion) as follows: 0.01-0.19 [critical], 0.20-0.39 [low], 0.40-0.59 [moderate], 0.60-0.79 [good], 0.80+ [very good]. The text labels are not yet decided, as the chosen numerical ranges and labels imply value judgments and members of the SC will have differing perspectives. Also relevant is whether the IWC allows exploitation on the stock, thereby implying a target level less than K. Several alternate suggestions for category labels were discussed by the Content Development ICG and are presented in Section 3.

Category labels were originally proposed to a 30-Year Change, and are based on noting that 30-year population growth of 35% (or decline of -25%) corresponds to an approximate annual growth rate (or rate of decline) of 1%, which may be a reasonable threshold for strong growth or decline. The Change labels from the GPA proposal are as follows: ≤ -25%=strong decrease, -24% to -11%=decreasing, -10% to 10%=stable, 11% to 34%=increasing, ≥35%=strong increase. However, some values in the examples provided in this proposal exceed this range, and ASI must consider how to address such cases, along with the category labels and time-span for Change. The Content Development ICG considered the category labels for Change acceptable, but the thresholds needed changing to reflect the new time span; again see Section 3.

After long debate and uncertain consensus, ASI recommended switching to 20-Year Change as a 'general standard', but noted that any deviations from this standard would make the thermometers non-comparable. This would completely defeat the purpose of the *Welcome* page. ASI therefore reluctantly, and somewhat tentatively, agreed to compute relative change over (usually) 20 years but switch the thermometers to display the annualized version of that number to maintain comparability, while noting serious problems with this approach, too. Intersessionally, at the request of the ASI convenor, the Content Development ICG revisited this debate and agreed that 20-Year Change is the best option (without annualization) as a simple, understandable, universal standard; see Section 3.

ASI has also considered whether to present assessment information for stocks when IWC assessment modeling is not available. The Content Development ICG believes that the SC is likely to favor inclusion of such cases, so we propose that when modeling is not available but some relevant evidence is published in the scientific literature, entries would be qualified as 'suspected'. The SC should provide guidance on what sort of published information should be considered, how it should be reviewed by the SC, and how to present it on the website. There will also be cases with little or no information. If the SC wishes to include these on the website, we propose that such entries would be 'unknown'. Further consideration of whether and how to handle such cases is needed.

Critically endangered stocks like the vaquita also warrant different treatment, regardless of whether the assessment is completed by the SC or other scientists. We include the vaquita as an example below to promote SC discussion of how to handle such cases.

2.5 *Population Status Tables*

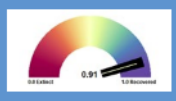
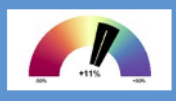
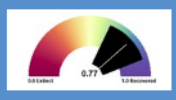
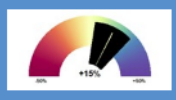
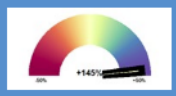
The *Population Status Tables* mockup constructed by the Secretariat includes essentially the same information and graphics as the *Welcome* page graphics from the GPA proposal, and now also includes a short text status summary statement in addition to the graphical **Relative Abundance** and **20-Year Change** figures.

mockup link: *Population Status Tables*

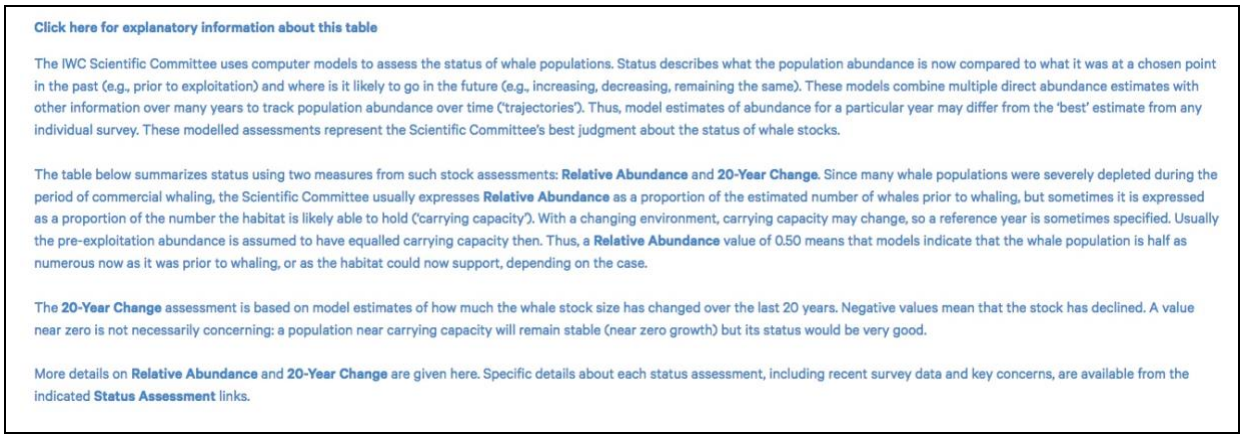
Population Status Tables

Status of Populations - measured by relative abundance and 20-year change

Click here for explanatory information about this table

Species	Population or Area	Relative Abundance	20-Year Change	Link to Status Assessment
Gray Whale  Gray whales are increasing, with the populations in the eastern Pacific likely near pre-whaling levels, but the situation for the small, threatened western Pacific population(s) remains uncertain.	Eastern North Pacific	**Very Good** 	**Increasing** 	here
Common Minke Whale  The North Atlantic common minke whale is generally abundant and slowly increasing, with populations in the western area likely fully recovered to pre-whaling levels. Populations in the eastern area not as large but growing more rapidly	North Atlantic	**Good** 	**Increasing** 	here
Vaquita  This small porpoise is the world's most endangered cetacean, and there may be only six to ten vaquita remaining. Extinction is likely. Any hope of saving the species, will require immediate action by national government, local authorities, and local fishers.	Gulf of California	**Critical** **10 animals**	**Strong Decrease**	statement
Bowhead Whale  The BCB and ECWG populations are large and significantly recovered from the era of commercial whaling. The BCB population is growing, and the ECWG population is growing or stable. The EGSB and O populations are concerningly small, but EGSB may be growing.	Bering-Chukchi-Beaufort Seas (BCB)	**Moderate** 	**Strong Increase** 	pending
	Eastern Canada – West Greenland (ECWG)	**Suspected: Moderate** 	**Suspected: Increasing** 	pending
	Okhotsk Sea (O)	**Suspected: Critical** 	**Suspected: Strong Decrease** 	none
	East Greenland – Svalbard – Barents Sea (EGSB)	**Suspected: Critical** 	**Unknown** 	none
Bryde's Whale	Etc...	Etc...	Etc...	Etc...

More detailed information is provided with a ‘click here…’ popup.



Click here for explanatory information about this table

The IWC Scientific Committee uses computer models to assess the status of whale populations. Status describes what the population abundance is now compared to what it was at a chosen point in the past (e.g., prior to exploitation) and where is it likely to go in the future (e.g., increasing, decreasing, remaining the same). These models combine multiple direct abundance estimates with other information over many years to track population abundance over time (‘trajectories’). Thus, model estimates of abundance for a particular year may differ from the ‘best’ estimate from any individual survey. These modelled assessments represent the Scientific Committee’s best judgment about the status of whale stocks.

The table below summarizes status using two measures from such stock assessments: **Relative Abundance** and **20-Year Change**. Since many whale populations were severely depleted during the period of commercial whaling, the Scientific Committee usually expresses **Relative Abundance** as a proportion of the estimated number of whales prior to whaling, but sometimes it is expressed as a proportion of the number the habitat is likely able to hold (‘carrying capacity’). With a changing environment, carrying capacity may change, so a reference year is sometimes specified. Usually the pre-exploitation abundance is assumed to have equalled carrying capacity then. Thus, a **Relative Abundance** value of 0.50 means that models indicate that the whale population is half as numerous now as it was prior to whaling, or as the habitat could now support, depending on the case.

The **20-Year Change** assessment is based on model estimates of how much the whale stock size has changed over the last 20 years. Negative values mean that the stock has declined. A value near zero is not necessarily concerning: a population near carrying capacity will remain stable (near zero growth) but its status would be very good.

More details on **Relative Abundance** and **20-Year Change** are given here. Specific details about each status assessment, including recent survey data and key concerns, are available from the indicated **Status Assessment** links.

2.6 *Stock Status Summary* and *Status Details* pages

The GPA proposal had separate *Stock Status Summary* and *Status Details* pages for three examples: Eastern North Pacific Gray Whales, North Atlantic Common Minke Whales, and Bowhead Whales. The corresponding Secretariat mockups combined the two pages (for gray whales; option #4a above), or the two pages plus the graphical table entry also shown on the ‘Population Status Tables’ page (for bowhead whales; option #4b above). The GPA proposal also included a single example, somewhat rudimentary, for a population (the vaquita) that had not been modeled using the typical SC processes but which was of great interest due to its very low numbers despite decades of SC warnings and recommendations that continuing declines could and would lead to extinction of the species.

We next show the sample pages from both the GPA proposal pages, updated with the addition of drawings or photographs and range maps which had previously been specified but not yet included. Following that are the Secretariat’s mockup pages.

example: a *Stock Status Summary* page

Status of Eastern North Pacific Gray Whales

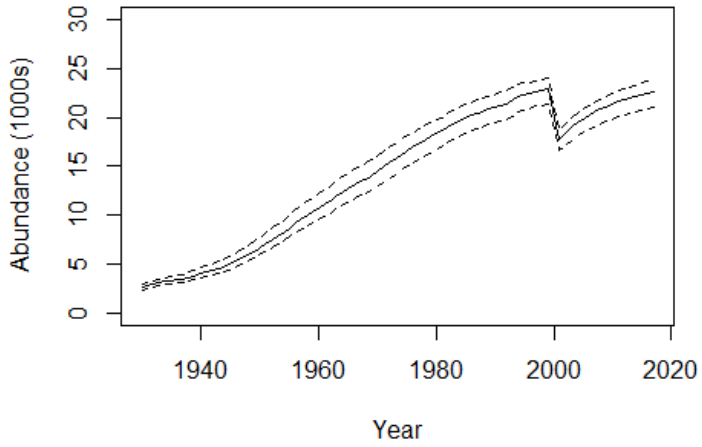
Eastern North Pacific gray whales (*Eschrichtius robustus*) are a large population that includes two small feeding groups of special concern to the Commission: the Western Feeding Group (WFG) and the Pacific Coast Feeding Group (PCFG). This population is subject to aboriginal subsistence hunting by Russia and the US, with a combined annual limit of 140 strikes.

The table below shows current IWC assessment model estimates and 90% uncertainty intervals for 2017 abundance, depletion level, and cumulative 30-year change. Hover over the estimates to see the uncertainty.

The most recent direct abundance estimate based on surveys is 20,580 (18,700-22,870) for 2019/20. More information about this species is given here and here.

	Modeled 2017 abundance		2017 depletion level		Percent change, 1987-2017	
WFG	173	(108 - 222)	0.69	(0.58 - 0.76)	303%	(195% - 398%)
PCFG	231	(215 - 245)	0.83	(0.80 - 0.86)	240%	(181% - 301%)
Entire population	22,199	(20,566 – 23,341)	0.91	(0.90 - 0.92)	11%	(7% - 16%)

The plot below shows how modeled total abundance has changed over time. This population is believed to experience periodic unexplained mortality events (perhaps 20% dying), as seem to have occurred in 1999-2000 and 2019-20.



Unresolved reviewer comment: The WFG is complicated and may include an unknown proportion of animals from the greatly reduced Western population. Again, we need to be careful about the use of words such as stock, group, aggregation, population, unit-to-conserve.
Comment from GHG Trying to avoid citations at this page level, but tempting to add one to the UME dates above the figure.

The WFG is a small, growing population component, but remains at risk from bycatch, development, and the threats listed below. The PCFG is also a small population component, which has grown over the last few decades and may now be close to its carrying capacity. The population as a whole is increasing and has recovered to near its carrying capacity. Threats include entanglement in fishing gear, vessel strikes, disturbance from whale watching, ocean noise, habitat degradation, climate change.

Data quality for this population is good. This status was last updated April 2022. Further details about the IWC SC assessment of ENP gray whales are available here. General information about how the IWC Scientific Committee assesses stock status is here.

example: a *Status Details* page

Details of Status Assessment for Eastern North Pacific Gray Whales

The assessment of Eastern North Pacific gray whales is based on the models and methods used in the development and testing of the Gray Whale Strike Limit Algorithm. Details are provided by [insert references]. This population includes two small feeding groups of special concern to the Commission: the Western Feeding Group (WFG) and the Pacific Coast Feeding Group (PCFG). Gray whales that do not belong to one of these two feeding groups are referred to as the Beaufort Sea – Chukchi Sea (BSCS) stock for assessment modeling, although biologically all three groups may constitute a single stock.

GHG comment: Stock structure is confusing, especially concerning WFG.
Unresolved reviewer comment: Further consideration of stock structure is needed here.

The base-case trials for the assessment are two Implementation Simulation Trials (Table 1), extracted from the full set of trials specified by [insert reference]. [Insert explanation of terms in column headings of Table 1, or refer to a citation].

Table 1: Base-case trials for assessment

			$MSYR_{1+}$			PCFG			
Trial	Description/stock hypothesis	PCFG or WFG in BSCS	North	PCFG	WFG	Imm.	Pulse	Bycatch	Conditioning
0A	Reference 3a	No	4.50%	4.50%	4.50%	2	20	D x 4	Yes
0B	Reference 5a	No	4.50%	4.50%	4.50%	2	20	D x 4	Yes

In these trials, MSYR1+ is pre-specified for the base-case trials (at 4.5%) and the stock does not start at carrying capacity. The trials include spatial strata, but these are used only to remove catches by stock and to fit to data. Results by area are ignored. Rather, results are shown for all stocks combined and for the WFG, the BSCS and PCFG groups separately. The estimates of 1+ depletion are expressed relative to current carrying capacity because carrying capacity may have changed for this stock.

Table 2 summarizes summary statistics by trial for the base-case trials. The following statistics are shown:

- current (2017) 1+ abundance;
- current (2017) depletion (number of animals aged 1+ and older relative to current 1+ carrying capacity);
- 30-year total change in 1+ abundance, 1987-2017, expressed as a percentage

Results include the median value and 5th and 95th percentiles for each trial.

Table 3 provides the overall assessment estimates, i.e., the average medians across trials, and the pooled 90% intervals for each statistic, where values are pooled over trials and simulations within trials.

Table 2: Summary statistics, by sub-stock and overall, by trial.

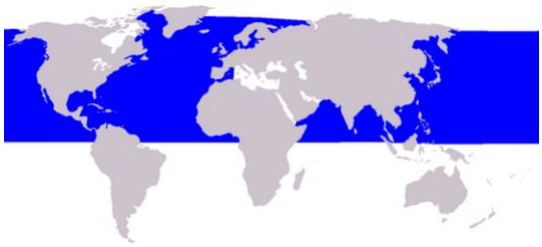
Trial	Statistic	Stock	5%	Median	95%
Reference 3a	**Abundance**	**WFG**	206	215	223
		BSCS	20,422	22,174	23,391
		PCFG	215	231	246
		Total	20,917	22,652	23,966
	Depletion	**WFG**	0.634	0.677	0.729
		BSCS	0.906	0.912	0.916
		PCFG	0.802	0.833	0.853
		Total	0.902	0.908	0.912
	30-Year Change	**WFG**	350	382	406
		BSCS	5	10	14
		PCFG	186	242	304
		Total	7	11	16
Reference 5a	**Abundance**	**WFG**	104	131	172
		BSCS	20,566	22,224	23,416
		PCFG	215	231	245
		Total	20,991	22,657	23,826
	Depletion	**WFG**	0.576	0.697	0.764
		BSCS	0.906	0.912	0.916
		PCFG	0.808	0.833	0.851
		Total	0.904	0.909	0.914
	30-Year Change	**WFG**	187	225	278
		BSCS	5	10	15
		PCFG	175	239	297
		Total	7	11	16

Table 3: Summary statistic medians averaged over trials, and upper and lower bounds for pooled 90% intervals for the summary statistics

Statistic	Stock	5%	Median	95%
Abundance	**WFG**	108	173	222
	BSCS	20566	22199	23341
	PCFG	215	231	245
	Total	20991	22655	23826
Depletion	**WFG**	0.583	0.687	0.751
	BSCS	0.906	0.912	0.916
	PCFG	0.804	0.833	0.851
	Total	0.902	0.909	0.913
30-Year Change	**WFG**	195	303	398
	BSCS	5	10	14
	PCFG	181	240	301
	Total	7	11	16

example: a *Stock Status Summary* page

Status of North Atlantic Common Minke Whales



North Atlantic common minke whales (*Balaenoptera acutorostrata*) are abundant in the North Atlantic. Two or three stocks are assumed, stratified longitudinally as eastern, possibly central, and western stocks. These whales are subject to aboriginal subsistence hunting by Greenland with a combined annual limit of 20 strikes (central stock) and 164 strikes (western stock). They are also hunted commercially by Norway, with catch limits determined by Norway, based on a variant of the Revised Management Procedure that was adopted by the Commission. Iceland has also hunted North Atlantic minke whales commercially in some recent years in accordance with limits calculated by the RMP.

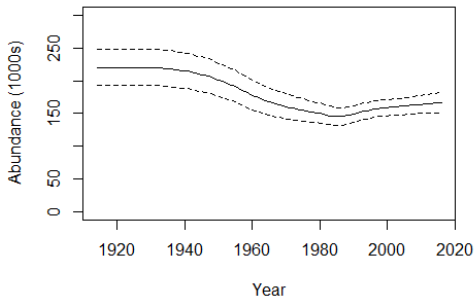
The table below shows current IWC model estimates and 90% uncertainty intervals for 2016 abundance, depletion level, and cumulative 30-year change, for three areas of the North Atlantic. Hover over the estimates to see the uncertainty. An explanation of the areas and a breakdown of the results by area are available here.

The most recent direct abundance estimates are 90,000 (62,000-128,000) for the eastern area in 2008-2013; 50,000 (30,000-83,000) for the central area in 2005-2007; and 5,100 (2,100-12,000) for the western area in 2015. More information about this species is given here and here.

GHG comment: Are these areas or stocks? Taken from IWC website, which doesn't explicitly say.
Unresolved reviewer comment: Especially tricky when pooling several hypotheses.

	Modeled 2016 abundance		2016 depletion level		Percent change, 1986-2016	
West	28,359	(16,925 – 44,349)	0.91	(0.62 – 1.35)	7	(-29 – 55)
Central	55,092	(35,964 – 75,313)	0.91	(0.61 – 1.20)	9	(-26 – 45)
East	82,919	(67,608 – 94,414)	0.66	(0.48 – 0.82)	24	(-3 – 40)
Entire population	165,831	(149,924 – 181,045)	0.77	(0.64 – 0.88)	15	(5 – 24)

Below is a plot of how modeled total abundance has changed over time.



North Atlantic minke whales are generally abundant and slowly increasing. Minke whales are least abundant in the western area, but nearly fully recovered there, although the most recent abundance estimate is less optimistic than the assessment model. Recovery is lower in the eastern region, but population growth is more rapid there. Threats include entanglement in fishing gear, vessel strikes, disturbance from whale watching, ocean noise, and habitat degradation.

How should we deal with the fact that the survey says 5K and the model says 28K with non-overlapping intervals?
Unresolved reviewer comment: It relates to stock structure hypotheses again.
Unresolved reviewer comment: Maybe just delete the sentence?

Data quality for this population is good (East) or fair (Central and West). This status was last updated April 2022. Further details about the IWC SC assessment of North Atlantic common minke whales is available here. General information about how the IWC Scientific Committee assesses stock status is here.

example: a *Status Details* page

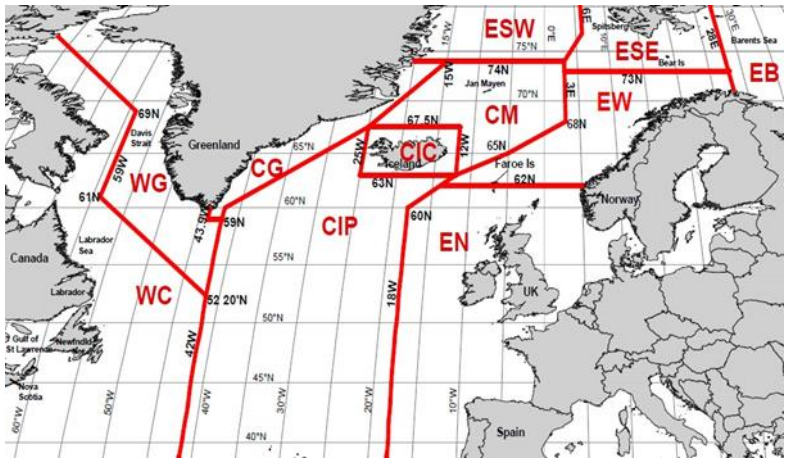
Details of Status Assessment for North Atlantic Common Minke Whales

The assessment of North Atlantic common minke whales is based on the models and methods used for Implementation Simulation Trials for the Revised Management Procedure (IWC, 2017). For assessing status, two different sets of stock structure assumptions are included among the base-case trials. These models posit either two or three distinct stocks found in the sub-areas in Figure 1. The stock structure hypotheses are:

1. There are three stocks. The 'W' stock populates small areas WG, WC, CIP, and CG. The 'C' stock populates small areas WG, CG, CIP, CIC, CM, EN and ESW. The 'E' stock populates areas CM, ESW, ESE, EB, EW and EN.
2. There are two stocks. The 'W*' stock populates small areas WC, WG, CG, CIP, CIC, CM, EN and ESW. The 'E' stock populates small areas CIP, CH, CIC, CM, ESW, ESE, EB, EW and EN. The 'W*' stock consists of two sub-stocks (W, C).

GHG comments: In these hypotheses, substock hypotheses unrelated to the assessment presented here are not mentioned. Authors and reviewers were confused about substocks, and the model implemented by Punt may differ from what is specified in Table 9 of IWC (2017) Appendix 4.

Figure 1: Map of the North Atlantic showing the sub-areas defined for the North Atlantic Minke whales.



For each stock structure model, there are two base-case trials using different levels of MSYR. Trial specifications are given in Table 1, extracted from the full set of trials specified by IWC (2017).

Table 1: Trials used for assessing North Atlantic common minke whales.

Trial	*MSYR*	Number of Stocks
NM01-1	1% (1+)	3
NM01-4	4% (mat)	3
NM02-1	1% (1+)	2
NM02-4	4% (mat)	2

Notwithstanding the stock structure definitions used for assessment modeling (including stock mixing parameters), there are many choices for how to summarize the results in a manner that best addresses Commission interests. For this assessment, results are summarized by *Medium Area*, namely W (WC+WG), C (CG+CIC+CIP+CM), and E (ESW+ESE+EB+EW+EN).

Table 2 summarizes summary statistics by trial for the base-case trials. The following statistics are shown:

- current (2016) 1+ abundance;
- current (2016) depletion (number of animals aged 1+ and older relative to 1+ carrying capacity);
- 30-year total change in 1+ abundance, 1986-2016, expressed as a percentage

Results include the median value and 5th and 95th percentiles for each trial.

Table 2: Summary statistics, by *Medium Area* and overall, for each trial

Trial	Statistic	Area	$MSYR_{1+}$ = 1%			$MSYR_{mat}$ = 4%		
			5%	Median	95%	5%	Median	95%
NM01 (3-stock)	**Abundance**	**W**	17,128	28,228	44,822	17,382	28,687	46,831
		C	35,341	54,896	75,016	36,387	55,926	77,248
		E	65,110	77,973	87,151	72,864	87,003	96,119
		Total	146,192	160,131	174,984	158,074	171,598	184,534
	Depletion	**W**	0.627	0.882	1.311	0.691	0.972	1.405
		C	0.565	0.835	1.053	0.653	0.944	1.25
		E	0.468	0.548	0.603	0.655	0.768	0.836
		Total	0.642	0.675	0.696	0.819	0.857	0.876
	30-Year Change	**W**	-25	5	53	-22	11	57
		C	-29	6	40	-24	11	55
		E	-6	10	18	14	36	44
		Total	3	8	10	18	22	25
NM02 (2-stock)	**Abundance**	**W**	16,420	28,113	44,137	16,474	28,407	49,526
		C	34,452	54,275	75,059	35,210	55,271	76,582
		E	66,693	78,391	87,117	75,204	88,311	96,137
		Total	147,395	160,175	175,195	158,568	171,422	186,413
	Depletion	**W**	0.555	0.837	1.296	0.621	0.952	1.411
		C	0.572	0.88	1.096	0.639	0.978	1.251
		E	0.475	0.548	0.6	0.668	0.769	0.815
		Total	0.64	0.675	0.698	0.818	0.856	0.876
	30-Year Change	**W**	-34	4	53	-31	9	59
		C	-30	7	39	-25	11	46
		E	-5	11	16	18	37	41
		Total	3	8	10	17	22	25

Table 3 provides the overall assessment estimates, i.e., the average medians across trials, and the pooled 90% intervals for each statistic, where values are pooled over trials and simulations within trials.

Table 3: Summary statistic medians averaged over trials, and upper and lower bounds for pooled 90% intervals for the summary statistics

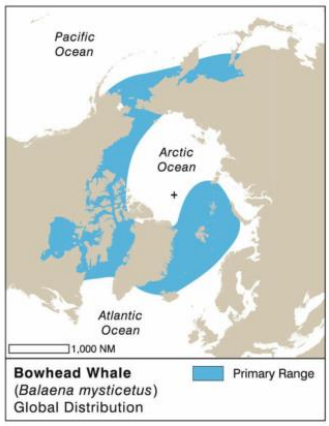
Statistic	Area	5%	Mean of Medians	95%
Abundance	**W**	16,925	28,359	44,349
	C	35,964	55,092	75,313
	E	67,608	82,919	94,414
	Total	149,924	165,831	181,045
Depletion	**W**	0.621	0.911	1.343
	C	0.613	0.909	1.194
	E	0.481	0.658	0.811
	Total	0.648	0.766	0.872
30-Year Change	**W**	-29	7	55
	C	-26	9	45
	E	-3	24	40
	Total	5	15	24

References

IWC. 2017. Report of the Scientific Committee, Annex D: Report of the Sub-committee on the Revised Management Procedure, Appendix 4: The AWMP/RMP Implementation Simulation Trials for the North Atlantic Minke Whales. J. Cetacean Res. Manage 18(Suppl.): 161-173.

example: a *Stock Status Summary* page

Status of Bowhead Whales



The bowhead whale (Balaena mysticetus) is a large baleen whale inhabiting the Arctic. There are believed to be four distinct populations: Bering-Chukchi-Beaufort Seas (BCB), Eastern Canada – West Greenland (ECWG), Okhotsk Sea (O), and East Greenland – Svalbard – Barents Sea (EGSB). The BCB stock is subject to aboriginal subsistence hunting by Russia and the USA, with a combined annual limit of 67 strikes. The ECWG is subject to aboriginal subsistence hunting by Canada and Greenland. The Greenland annual limit is 2. Canada is not a member of the IWC and issues a national limit of 5 [strikes or landings?] [insert hyperlink].

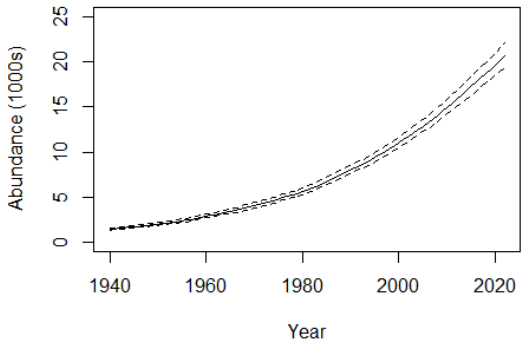
The levels of assessment are different for the four stocks. For BCB and ECWG, population models are fit to multiple survey abundance estimates. For O and EGSB, few data and no modeling are available. Only the BCB stock has been modeled for an assessment of status. See here for an explanation of the assessments and estimates shown in the table below.

The table below shows corresponding abundance estimates and 90% uncertainty intervals for recent abundance, depletion, and 30-year change. The tabled results for BCB bowheads are from the assessment model; for the remaining stocks only the most recent survey abundance is shown. The most recent survey abundance for BCB bowheads is 14,025 (8,964 – 21,942) in 2019. Hover over the estimates to see the uncertainty.

More information about this species is given here and here.

	Abundance		Depletion		Percent Change (1992-2022)	
BCB	20,683 (in 2022)	(19,323 – 22,325)	0.47	(0.42 – 0.59)	145	(118 – 154)
ECWG	6,446 (in 2013)	(3,876 – 10,721)				
EGSB	318 (in 2017)	(110 – 956)				
O	218 (in 2016)	CV=0.22				

Below is a plot of how the model-estimated total abundance for BCB bowheads has changed over time.



The BCB and ECWG populations are large stocks, growing over the last few decades and either growing or stable now. Estimates of depletion for the BCB stock are difficult to interpret because historical and current carrying capacity may differ to a degree that cannot be estimated with current models; the population may be near or above the pre-exploitation level. The EGSB and O stocks are currently very small. The O stock is likely declining or possibly stable. Recent sightings suggest EGSB might be growing. Threats include entanglement in fishing gear, vessel strikes, disturbance from whale watching, ocean noise, habitat degradation, and climate change.

Data quality for this population is good for BCB and ECWG, and poor for EGSB and O. This status was last updated April 2022. Further details about the IWC SC assessment of bowhead whales are available here. General information about how the IWC Scientific Committee assesses stock status is here.

ASSESSMENT NOTES: BOWHEAD WHALES

No *Status Details* page is available at this time

It may be preferable for this content to be delivered as a linked PDF file rather than a webpage.

The SC has not discussed the details of how to handle a case like this. Therefore, we are leaving the contents of this page blank for now.

The numbers in the bowhead status report page were derived as follows:

BCB: There is no agreed SC assessment method. Punt used methods from the 2010s, ultimately built upon the simulation framework for the Bowhead SLA. However, several important specifications were based on ad hoc assumptions by Punt and Givens. SC guidance is necessary. For example, the choice of starting year, abundance estimates to use, and the approach for dealing with historical catches and assumptions about K need discussion. In particular, the assessment results are not informative about K, leading to a depletion estimate of 0.47 even though the stock may be at or above pre-exploitation level. It is concerning to report 0.47 on the main status page or the bowhead status report page. Issues with the recent catch record were also discovered. The exercise of producing these example results has illustrated the need for the SC to develop a system for specifying and regularly updating the specifications for Status of Stocks assessments.

ECWG: No assessment is completed. In the bowhead status report page the abundance estimate from Doniol-Valcroze et al. (2015) is reported. It is unclear whether such survey estimates should be tabled alongside assessment modeling results. It is confusing when different sorts of estimates are presented in the same table, and troubling that different stocks are treated differently. Moreover, providing those results may lead to conflicts with the IWC website's population abundance estimates page.

EGSB: The same issues arise as for ECWG. The abundance estimate is from Hansen et al. (2018).

O: The same issues arise as for ECWG. The abundance estimate is from Cooke et al. (2017).

Speculations about the depletion and trend for EGSB and O at the bottom of the bowhead status report page are from Givens and Heide-Jørgensen (2021).

References

Cooke, J.G., Shpak, O.V., Meschersky, L.G., Burdin, A.M., MacLean, S.A., Chichkina, A.N. et al. 2017. Updated estimates of population and trend for Okhotsk Sea bowhead whales. Paper SC/67a/NH10 presented to the Scientific Committee of the International Whaling Commission. Available from www.iwc.int.

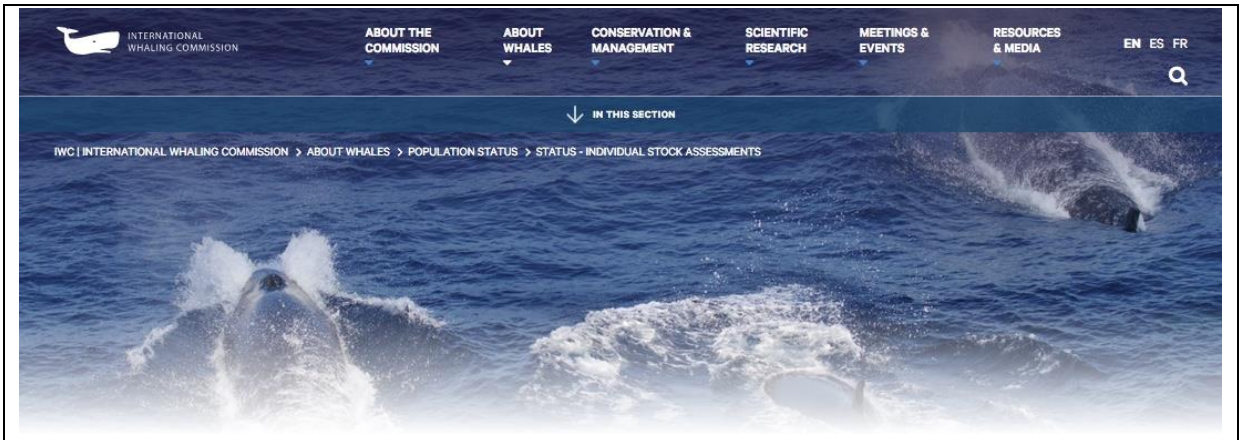
Doniol-Valcroze, T., Gosselin, J.-F., Pike, D.G., Lawson, J.W., Asselin, N.C., Hedges, K.J., and Ferguson, S.H.. 2015. Abundance estimate of the Eastern Canada – West Greenland bowhead whale population based on the 2013 High Arctic Cetacean Survey. DFO Can. Sci. Advis. Sec. Res. Roc. 2015/058.

Givens, G.H. and Heide-Jørgensen, M.P. 2020. Abundance. In J.C. George and J.G.M. Thewissen (Eds.) The Bowhead Whale. Elsevier Inc., Philadelphia PA. 640pp.

Hansen, R.G., Borchers, D., and Heide-Jørgensen, M.P. 2018. Summer surveys of marine mammals in the Greenland Sea and the Northeast Water and winter survey of marine mammals in the Northeast Water—preliminary report from field work in 2017 and 2018. Greenland Institute of Natural Resources.

The Secretariat had developed mockups containing this content in two formats, option #4a and #4b.

mockup link: a combined *Stock Status Summary* and *Status Details* page ('Option 4a')



Status of Eastern North Pacific Gray Whales

Eastern North Pacific gray whales (*Eschrichtius robustus*) are a large population that includes two small feeding groups of special concern to the Commission: the Western Feeding Group (WFG) and the Pacific Coast Feeding Group (PCFG). This population is subject to aboriginal subsistence hunting by Russia and the US, with a combined annual limit of 140 strikes.

The table below shows current IWC assessment model estimates and 90% uncertainty intervals for 2017 abundance, depletion level, and cumulative 30-year change. Hover over the estimates to see the uncertainty.

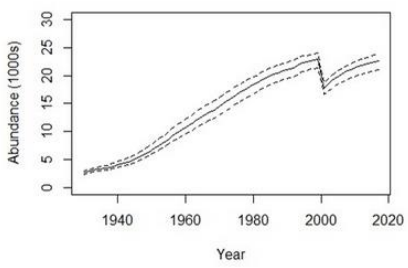
The most recent direct abundance estimate based on surveys is 20,580 (18,700-22,870) for 2019/20. More information about this species is given here and here.

	Modeled 2017 abundance		2017 depletion level		Percent change, 1987-2017	
WFG	173	(108 - 222)	0.69	(0.58 - 0.76)	303%	(195% - 398%)
PCFG	231	(215 - 245)	0.83	(0.80 - 0.86)	240%	(181% - 301%)
Entire population	22,199	(20,566 – 23,341)	0.91	(0.90 - 0.92)	11%	(7% - 16%)

The plot below shows how modelled total abundance has changed over time. This population is believed to experience periodic unexplained mortality events (perhaps 20% dying), as seem to have occurred in 1999-2000 and 2019-20.

The WFG is a small, growing population component, but remains at risk from bycatch, development, and the threats listed below. The PCFG is also a small population component, which has grown over the last few decades and may now be close to its carrying capacity. The population as a whole is increasing and has recovered to near its carrying capacity. Threats include entanglement in fishing gear, vessel strikes, disturbance from whale watching, ocean noise, habitat degradation, climate change.

Data quality for this population is good. This status was last updated April 2022. Further details about the IWC SC assessment of ENP gray whales are available here. General information about how the IWC Scientific Committee assesses stock status is here.



Details of Status Assessment for Eastern North Pacific Gray Whales

The assessment of Eastern North Pacific gray whales is based on the models and methods used in the development and testing of the *Gray Whale Strike Limit Algorithm*. Details are provided by [insert references]. This population includes two small feeding groups of special concern to the Commission: the Western Feeding Group (WFG) and the Pacific Coast Feeding Group (PCFG). Gray whales that do not belong to one of these two feeding groups are referred to as the Beaufort Sea – Chukchi Sea (BSCS) stock for assessment modelling, although biologically all three groups may constitute a single stock.

The base-case trials for the assessment are two *Implementation Simulation Trials* (Table 1), extracted from the full set of trials specified by [insert reference]. [Insert explanation of terms in column headings of Table 1, or refer to a citation].

Table 1: Base-case trials for assessment

				MSYR1+		PCFG			
Trial	Description/stock hypothesis	PCFG or WFG in BSCS	North	PCFG	WFG	Imm.	Pulse	Bycatch	Conditioning
0A	Reference 3a	No	4.50%	4.50%	4.50%	2	20	D x 4	Yes
0B	Reference 5a	No	4.50%	4.50%	4.50%	2	20	D x 4	Yes

In these trials, $MSYR_{1+}$ is pre-specified for the base-case trials (at 4.5%) and the stock does not start at carrying capacity. The trials include spatial strata, but these are used only to remove catches by stock and to fit to data. Results by area are ignored. Rather, results are shown for all stocks combined and for the WFG, the BSCS and PCFG groups separately. The estimates of 1+ depletion are expressed relative to current carrying capacity because carrying capacity may have changed for this stock.

Table 2 summarizes summary statistics by trial for the base-case trials. The following statistics are shown:

- current (2017) 1+ abundance;
- current (2017) depletion (number of animals aged 1+ and older relative to current 1+ carrying capacity);
- 30-year total change in 1+ abundance, 1987-2017, expressed as a percentage

Results include the median value and 5^{th} and 95^{th} percentiles for each trial.

Table 3 provides the overall assessment estimates, i.e., the average medians across trials, and the pooled 90% intervals for each statistic, where values are pooled over trials and simulations within trials.

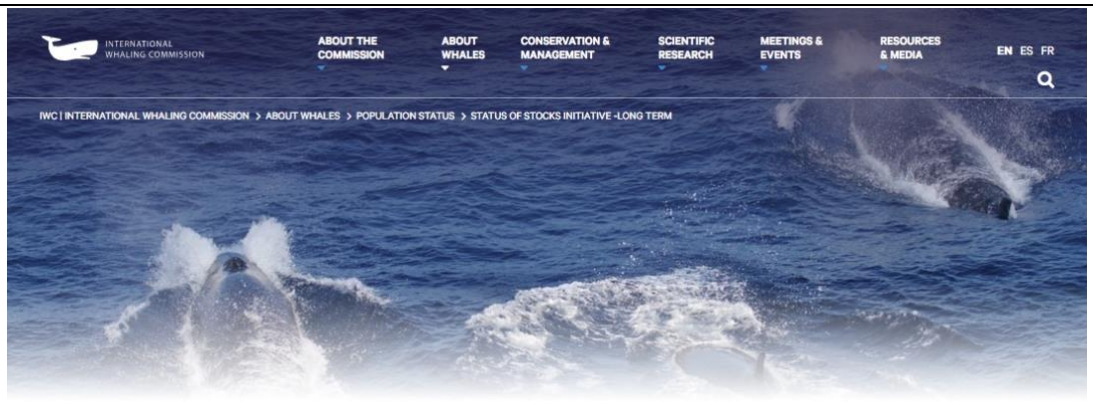
Table 2: Summary statistics, by sub-stock and overall, by trial.

Trial	Statistic	Stock	5%	Median	95%
Reference 3a	Abundance	WFG	206	215	223
		BSCS	20,422	22,174	23,391
		PCFG	215	231	246
		Total	20,917	22,652	23,966
	Depletion	WFG	0.634	0.677	0.729
		BSCS	0.906	0.912	0.916
		PCFG	0.802	0.833	0.853
		Total	0.902	0.908	0.912
	30-Year Change	WFG	350	382	406
		BSCS	5	10	14
		PCFG	186	242	304
		Total	7	11	16
Reference 5a	Abundance	WFG	104	131	172
		BSCS	20,566	22,224	23,416
		PCFG	215	231	245
		Total	20,991	22,657	23,826
	Depletion	WFG	0.576	0.697	0.764
		BSCS	0.906	0.912	0.916
		PCFG	0.808	0.833	0.851
		Total	0.904	0.909	0.914
	30-Year Change	WFG	187	225	278
		BSCS	5	10	15
		PCFG	175	239	297
		Total	7	11	16

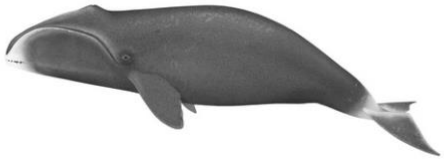
Table 3: Summary statistic medians averaged over trials, and upper and lower bounds for pooled 90% intervals for the summary statistics

Statistic	Stock	5%	Median	95%
Abundance	WFG	108	173	222
	BSCS	20566	22199	23341
	PCFG	215	231	245
	Total	20991	22655	23826
Depletion	WFG	0.583	0.687	0.751
	BSCS	0.906	0.912	0.916
	PCFG	0.804	0.833	0.851
	Total	0.902	0.909	0.913
30-Year Change	WFG	195	303	398
	BSCS	5	10	14
	PCFG	181	240	301
	Total	7	11	16

mockup link: a combined *Stock Status Summary* page with graphical *Population Status* table ('Option 4b')



Status of Bowhead Whales



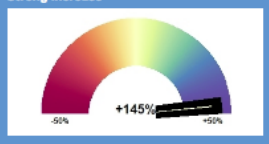
Summary

The bowhead whale is a large baleen whale inhabiting the Arctic. At least two stocks are now in a healthy state. The population in the Bering-Chukchi-Beaufort Seas has been increasing annually at over 3% since the first reliable census in 1978 and may be approaching pre-exploitation levels. In 2011 its abundance was nearly 17,000 animals.

The eastern Arctic-West Greenland population numbers around 6-8,000. There are no good estimates of abundance for the Spitsbergen or Okhotsk Sea stocks but they show no signs of significant recovery.

Status measures by relative abundance and change over 20 years

Click here for explanatory text about the table below

Species	Population or Area	Relative Abundance	20-Year Change	Link to Status Assessment
Bowhead Whale	Bering-Chukchi-Beaufort Seas	**Moderate** 	**Strong Increase** 	pending
	Eastern Canada – West Greenland	**Suspected: Moderate** ?	**Suspected: Increasing** ?	pending
	Okhotsk Sea	**Suspected: Critical** ?	**Suspected: Strong Decrease** ?	none
	East Greenland – Svalbard – Barents Sea	**Suspected: Critical** ?	**Unknown** ?	non

There are believed to be four distinct populations of bowhead whale: Bering-Chukchi-Beaufort Seas (BCB), Eastern Canada – West Greenland (ECWG), Okhotsk Sea (O), and East Greenland – Svalbard – Barents Sea (EGSB). The BCB stock is subject to aboriginal subsistence hunting by Russia and the USA, with a combined annual limit of 67 strikes. The ECWG is subject to aboriginal subsistence hunting by Canada and Greenland. The Greenland annual limit is 2. Canada is not a member of the IWC and issues a national limit of 5 [strikes or landings?].

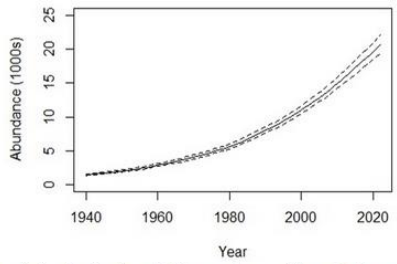
The levels of assessment are different for the four stocks. For BCB and ECWG, population models are fit to multiple survey abundance estimates. For O and EGSB, few data and no modelling are available. Only the BCB stock has been modelled for an assessment of status. See here for an explanation of the assessments and estimates shown in the table below.

The table below shows corresponding abundance estimates and 90% uncertainty intervals for recent abundance, depletion, and 20-year change. The tabled results for BCB bowheads are from the assessment model; for the remaining stocks only the most recent survey abundance is shown. The most recent survey abundance for BCB bowheads is 14,025 (8,964 – 21,942) in 2019. Hover over the estimates to see the uncertainty.

More information about this species is given here and here.

	Abundance		Depletion		Change (1992-2022)	
BCB	20,683 (in 2022)	(19,323 – 22,325)	0.47	(0.42 – 0.59)	14.5%	(118% - 154%)
ECWG	6,446 (in 2013)	(3,876 – 10,721)				
EGSB	318 (in 2017)	(110 – 956)				
O	218 (in 2016)	CV=0.22				

Below is a plot of how the model-estimated total abundance for BCB bowheads has changed over time.



The BCB and ECWG populations are large stocks, growing over the last few decades and either growing or stable now. Estimates of depletion for the BCB stock are difficult to interpret because historical and current carrying capacity may differ to a degree that cannot be estimated with current models; the population may be near or above the pre-exploitation level. The EGSB and O stocks are currently very small. The O stock is likely declining or possibly stable. Recent sightings suggest EGSB might be growing. Threats include entanglement in fishing gear, vessel strikes, disturbance from whale watching, ocean noise, habitat degradation, and climate change.

Data quality for this population is good for BCB and ECWG, and poor for EGSB and O. This status was last updated April 2022. Further details about the IWC SC assessment of bowhead whales are available here. General information about how the IWC Scientific Committee assesses stock status is here.

For more information about bowhead whales click here.

2.7 *Methods Document* page

The current draft content (including blue boxed unresolved commentary) is given below. This version has not been updated to switch from 30-year change to 20-year.

GPA comment: An additional section to this document should explain what is presented when we have fair/good information, including abundance estimates, but no completed assessment (e.g., ECWG bowheads), and when status is clear even with only minimal available data (e.g. vaquita).
Givens comment: A paragraph on carrying capacity and pre-exploitation size is needed. An introductory explanation was given on the main webpage, but this should be elaborated here. A reviewer concurs, and adds:
Unresolved reviewer comment:
In a single place an explanation is needed of the distinctions between the simplest case of estimating a pre-exploitation level from application of a simple DD population model with K unchanging over time, to the various other approaches we use with a 'current' K (possibly changing over time) and how that is estimated. This is especially given pertinence to associated 'depletion' estimates and how they should be viewed in terms of their meaning and the reliability of the associated estimate.
Unresolved reviewer comment: Below the bullet list is a paragraph that includes a definition of $MSYR_{mat}$ in the final sentence. A reviewer commented that s/he believes that the definition should not refer to females only, but to both sexes assuming the same maturity-at-age vector for males as for females. Punt wrote the paragraph, but Givens believes the reviewer is correct and the wording should be revised.
Givens comment: In the section on summarizing status, the text prescribes pro-rating among Medium Areas. I'm not sure how this is implemented or whether it has been done in the NA minke example.

example: draft *Methods Document page*

The IWC Scientific Committee's Status of Stocks Assessment Methods

This page provides background on the methods used to assess whale populations for the IWC Scientific Committee's Status of Stocks webpage. Brief introductions to the computer modeling and statistical estimation approaches are provided, but many methods are case-specific so further details should be sought on the assessment page for each stock. The rating systems for the Relative Abundance and 30-Year Change measures used on the Status of Stocks webpage are also explained here.

Background on assessments

Assessments of cetacean populations are conducted by fitting population dynamics models to monitoring data. The structure of the population dynamics model and the types of data used for parameter estimation differ among species and regions. Assessments of many species are based on population dynamics models that track the population by age and sex, and may also take account of the spatial structure of the population. Other assessments are based on population models that aggregate population numbers over age and sex, and assume that there is a single population only in the region being assessed. The monitoring data available differ among species but the most common data sources are removals (e.g., commercial catches, bycatch and aboriginal takes), estimates of absolute abundance from surveys, and data on movement from tagging or mark-recapture studies. The parameters of a cetacean population dynamics model include: population size in the first year of the modelled period (or, sometimes, the population size at carrying capacity or prior to commercial exploitation); those that relate to productivity and mortality; and, where appropriate, those that represent movement and dispersal rates. Some assessments will estimate all of these parameters while others will pre-specify some of the values for these parameters based on auxiliary information.

The result of fitting such a model is a set of estimates and predictions. Assessments can provide estimates of many quantities, including: the numbers of animals aged 1 and older ('1+ abundance'), mature females and/or calves in various years; the annual proportion of the population dying due to anthropogenetic causes; movement rates of whales between regions; and estimates of the model parameters such as productivity or carrying capacity. However, for consistency among the various types of models used for assessment (and for consistency with the estimates provided by abundance surveys) results are most commonly expressed in terms of 1+ abundance. The Scientific Committee's assessment of population status is based on a time series of estimated 1+ abundances.

Assessments, particularly those on which evaluation of management approaches for commercial or aboriginal whaling are based, often involve many alternative models. These models often consider alternative assumptions about the number of stocks in the region, how they mix and animals disperse among stocks, and historical removals (e.g., due to uncertainty in levels of bycatch). The relative plausibility of all alternative models will not be same and the Scientific Committee usually divides the plausible models into (i) more likely (or base-case) models and (ii) other models used to examine sensitivity to the assumptions of the base-case models. Models of the second type are often much less plausible that the base-case models. Implausible models are rejected and their results are not reported.

Representing uncertainty is core to any assessment. The types of uncertainties commonly captured in assessments are model and estimation uncertainty. Model uncertainty relates to uncertainty about the underlying structure of the system being modelled, such as how many stocks are in the region in which the species is found and how they move and/or mix. Estimation uncertainty is quantified by the statistical analysis used to fit the model to available data.

Assessments are used by the IWC to understand historical and future trends of populations given past removals and possible strategies for setting future limits of removals. For many stocks therefore assessments were not primarily designed to estimate status but rather to determine whether a particular removal strategy is sustainable and robust to uncertainty. Nevertheless, the results of an assessment can be used to summarize status by focusing on the base-case (or most likely) models. To generate the status assessments on the IWC Scientific Committee's Status of Stocks webpage, the estimates from one or more base-case models are combined as described later in this document.

The detailed assessment results for each stock are accompanied with an assessment of data availability and quality. The rating system used is as follows:

- **Good**: At least one abundance estimate endorsed by the Scientific Committee within the last 10 years. Usually, several abundance estimates available for different years. The surveys covered, or can be reliably extrapolated to, most of the presumed stock range. Uncertainty and bias of these estimates is understood and not too large (corresponding to category 1 or 2 using the system applied in the Scientific Committee's Consolidated Table of Agreed Abundance Estimates (IWC 2014, 2017). Stock structure is reasonably well understood or subject to a small number of competing hypotheses whose impact on assessment is not critical. The major sources of human induced mortality are understood and reasonably well quantified.
- **Fair**: Abundance estimates are available, but they do not meet the standards for **Good**. For example, survey coverage may be limited or estimation uncertainty may be high. Abundance estimates may correspond to category 3 using the system applied in the Scientific Committee's Consolidated Table of Agreed Abundance Estimates, (IWC 2014, 2017). Stock structure is poorly understood, and/or competing hypotheses have important impacts on assessment results. Nevertheless, the information available is adequate to provide some general indication of abundance.
- **Poor**: Abundance estimates, if any, originate from surveys covering only a small portion of the range of the stock, are highly imprecise, or may have large and/or unknown bias. Abundance estimates have often not been reviewed or endorsed by the Scientific Committee; any endorsed estimates correspond to category 3, or worse. Little information may be available about stock structure.

Summarizing status

For any specific model, the results of fitting the model include the following three quantities:

- Current 1+ abundance: the estimate of 1+ abundance in the final year of the assessment
- Current 1+ relative abundance: the estimate of 1+ abundance in the final year of the assessment expressed as a proportion of the pre-exploitation number of 1+ animals, or as a proportion of current carrying capacity, depending on the assessment.
- Time-trajectory of 1+ abundances: the time-series of the numbers of 1+ animals from the first year of the assessment to the final year. This provides information on the rate of population increase over the most recent 30 years, for example.

A key uncertainty in cetacean assessments is the extent of productivity, quantified using the MSY rate parameter (i.e., MSYR). Here, MSYR is defined as the ratio of maximum sustainable yield (MSY) to the population abundance when exploitation rate equals that corresponding to MSY. Thus, unless the assessment estimates MSYR, the three quantities above are reported for (at least) two levels of productivity: the lowest plausible value in the base-case models and MSYRmat=4%. The default value for the lowest plausible MSYR is MSYR1+=1%. MSYR1+ is the MSYR in the theoretical situation when harvesting is on animals aged 1+ without any selection, while MSYRmat is MSYR in the theoretical situation when harvesting is on females that are mature.

The IWC SC will select a set of model configurations with different MSYR values, from those included in the 'base-case', and those configurations will be fit using either Bayesian or maximum likelihood methods. Uncertainty estimation usually uses either Bayesian or bootstrap methods. The particular models, MSYR values, and other details differ in each application; the specifics can be found using the Assessment link provided next to each status summary on the Status of Stocks webpage.

The results for each model configuration are summarized by a set of (usually 100) parameter vectors (and hence corresponding sets of values for current 1+ abundance, current 1+ depletion, and the time-series of the number of 1+ animals). Assessments provide estimates for each stock within the region, which makes summarizing results difficult because the number of stocks may differ among model configurations. Consequently, status results are provided for the Medium Areas (the IWC SC defines a *Medium Area* as an area that corresponds to the known or suspected range of a distinct biological stock (IWC, 1999) or the entire Ocean Basin (or 'Region') if there are no *Medium Areas*. In some cases, results may be presented for individual stocks if the Scientific Committee believes that the Commission needs to be informed about the specific stock (e.g., if it is subject to aboriginal subsistence hunting) because reporting results by area might be misleading. Similarly, results for particular sub-stocks of interest (a 'sub-stock' is insert here) may be computed (and reported) separately

if these sub-stocks are of particular management interest to the Commission. For the purposes of computing the summary statistics, when a stock is found in multiple *Medium Areas* the estimates of abundance are pro-rated among *Medium Areas*.

Summary statistics are computed using the distributions of values from the selected base-case models. Medians and 90% intervals are computed. Details are given below. Insert explanation of how trajectory plots and bands are computed.

Relative Abundance and 30-Year Change Statistics

For each assessed stock, two statistics are displayed on Status of Stocks webpages: **Relative Abundance** and **30-Year Change**. The **Relative Abundance** statistic is often termed 1+ depletion (1+ abundance in the current year divided by either 1+ abundance prior to exploitation or current carrying capacity, depending on the assessment). The **30-Year Change** statistic is the ratio of current 1+ abundance to the 1+ abundance 30 years prior, expressed as a percent increase.

As described above, a set of values for **Relative Abundance** and **30-Year Change** are generated for each base-case model used in the assessment, using the statistical estimation and uncertainty approach used in that analysis. These values are then pooled, and the central 90% of values are taken to represent the range of uncertainty for each statistic. The average of the medians from the separate sets of base-case values is used as the best estimate.

Semicircular thermometer graphs on the Status of Stocks webpage are used to present the results. For **Relative Abundance**, the left edge of the plot corresponds to zero (extirpated), and the right edge corresponds to 1.0 (1+ abundance equal to pre-exploitation level or current carrying capacity, depending on the assessment). The black wedge spans the 90% uncertainty range. The estimated value of **Relative Abundance** is printed in the center of the thermometer and indicated with a yellow needle. Beneath the graph is a label to characterize the estimated value, using the following scale: 0.01-0.19=[critical], 0.20-0.39=[low], 0.40-0.59=[moderate], 0.60-0.79=[good], 0.80+=[very good].

For **30-Year Change**, a similar display is used. The range of the thermometer is -50% to +50%. The labels used to characterize the estimated **30-Year Change** are based on the principle that a 30-year increase of 35% roughly corresponds to an annual increase rate of 1%, and a 30-year decrease of -25% roughly corresponds to an annual decrease rate of -1%. Therefore, the **30-Year Change** labels are: ≤-25%=strong decrease, -24% to -11%=decreasing, -10% to 10%=stable, 11% to 34%=increasing, ≥35%=strong increase. The estimated **30-Year Change** value is printed in the center of the thermometer. It should be noted that a low **30-Year Change** rate is not necessarily concerning, because a population near its carrying capacity (and hence having very good status) would be expected to remain nearly stable (near zero growth).

When the uncertainty range of the statistic estimate exceeds the range of the corresponding thermometer, the black wedge is supplemented with an arrow to indicate that the range extends beyond the graph edge. [not implemented yet]

References

IWC. 1999. Report of the Scientific Committee, Annex N: The Revised Management Procedure (RMP) for Baleen Whales. *J. Cetacean Res. Manage* 1(Suppl.): 251-258.

mockup link: *Population Status Assessments: Methodology* page

The mockup page for this is essentially a direct transcription of the above, formatted for a browser window. For brevity we don't display it here.

2.8 *Glossary and Terminology* page

Although this was identified as an important component, no example has yet been generated. Discussions so far have been limited to a few key terms (e.g. stock, population, assessment, depletion) and consideration of what options (including footnotes, popup boxes, blue colored links in the text, etc. could be used to provide definitions and explanations of terms and concepts throughout various Status of Stocks webpages.

3. RESULTS OF THE CONTENT DEVELOPMENT ICG DISCUSSIONS ON OUTSTANDING ISSUES

In addition to email discussions, the Content Development ICG has held a series of online meetings since SC68D to work on a set of outstanding tasks (compiled by ASI convenor Givens) for the design and construction of Status of Stocks website pages. Online meetings were held on 22 Nov. 2022, 17 Jan. 2023, 8 Feb. 2023, and 1 Mar. 2023. Each meeting considered a list of tasks and decisions to be considered, with any emailed comments submitted in advance added to the meeting outline document. Notes about additional comments and decisions made during the meeting were compiled onto the document and then it was circulated to all ICG members afterward so that all members, including any who were unable to attend a particular meeting could see what comments, suggestions or decisions were made. Incomplete or remaining tasks were added to a new document to guide later meetings; all such decisions are expected to be reviewed by ASI and then by the full SC at SC69A. At the 1 March 2023 meeting screen captures from the mockup web pages developed by Secretariat staff were included in the meeting outline document, and the Secretariat additionally created mockups with 'hidden' URLs (not accessible from existing web page menus) so that ICG members could see how the pages looked and behaved during online demonstrations and testing. These links have been provided above, but we repeat them here:

Page Name	link (URL) to mockup webpage
Introduction to Population Status	https://iwc.int/html_731
Population Status Tables	https://iwc.int/html_712
Status of Eastern North Pacific Gray Whales (Option 4a)	https://iwc.int/html_713
Status of Bowhead Whales (Option 4b)	https://iwc.int/html_714
Population Status Assessments: Methodology	https://iwc.int/html_717

The following subsections list a variety of new issues, suggestions and recommendations by the Content Development ICG. ASI should evaluate, revise, and hopefully endorse these at SC69A.

3.1 What is the point-of-entry for SOSI?

In Section 2, we outline the design proposed by GPA, and how it was implemented by the Secretariat. There is a fundamental difference pertaining to the SOSI point-of-entry. The GPA proposal leads with brief text and the

table of thermometers, summary statements, and links. Other introductory material is deferred. The Secretariat implementation leads with a much longer text page, with a highlighted box introducing SOSI, and links to other SOSI material. The table of thermometers, etc., is offered from the www.iwc.int menu at the same level as this page, but as a second option. Since the point-of-entry will be the first SOSI content seen by interested visitors, and for many may be the only content they care to read, it is important that agreement is reached about which information is presented there, and how. The Content Development ICG noted this issue, but did not discuss a preference. We recommend that ASI finalize a recommendation now.

3.2 What to do with the Population Status – Short Summaries page?

The www.iwc.int website already has an existing page providing some information about status (although some content is basic information about the species/stocks, rather than status per se). This page is at https://iwc.int/about-whales/population-status. This page is not part of SOSI. The Content Development ICG noted that it would be important to reconcile this content with SOSI content. It is unclear how to do so because (a) the existing page contains information about more species/stocks than SOSI will in the near term, (b) some of the existing content may conflict with SOSI or need to be updated, and (c) much of the content is not, strictly speaking, about status.

3.3 Option 4a versus 4b (*Status Summary* and *Details* pages)

The Secretariat mockups offered two different approaches to presenting the species-specific status summaries and details information. These options were labeled #4a and #4b above, and mockups of each are shown. The Content Development ICG recommends that ASI endorse one or the other.

3.4 Small, unmodeled populations or data-poor cases –drafting a general template using examples

The SC has struggled with the question of whether and how SOSI should also address species/stocks for which comprehensive population models are not available, noting that such situations can be quite diverse, ranging from the vaquita (for which the concerns about status are serious) to ECWG bowheads (for which there are good data available, but no SC assessment, and the stock is not depleted). It was also suggested that it would be important to consider whether model-based status assessments developed and published outside of the Committee's work should be included in Status of Stocks webpages. If so, the evaluation of such assessments and the priority for their inclusion would require discussion. Different suggestions were made on how to address this issue, including possibly adding a notation on the relevant website page that the Committee was only providing information that it had fully reviewed. When external assessments were available but had not yet been subject to SC review, the SC might establish its own expert panel to review the published information to enable SOSI to incorporate that assessment. For data-limited stocks, a qualitative assessment might be sufficient, and the status information would not need to be more detailed than what is displayed on the proposed *Welcome* page and *Status Summary* page, absent full assessment modelling results. It was noted that the GPA proposal included the use of the 'Suspected…' qualifier for such cases on the *Welcome Page*, and the status of 'Unknown' for cases even more poorly understood. Furthermore, the GPA proposal included a system for rating data quality, which would be noted on the *Status Summary* page.

example: graphical status summary table entry for vaquita

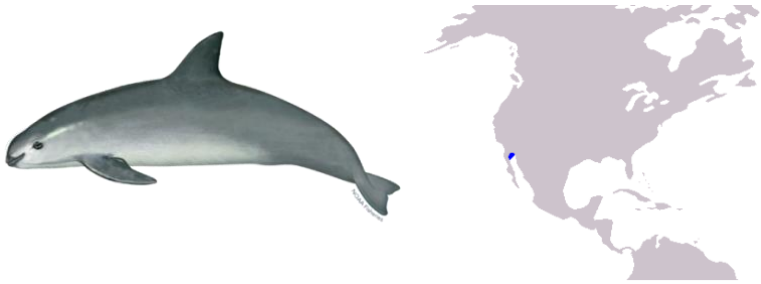
The vaquita is a good example to consider some of the issues raised in this subsection. The *Welcome* page shows one tentative approach.

Vaquita [add link] 	Gulf of California	**10 animals** **Critical**	**Strong Decrease**	statement

The vaquita is also a prime focus of the IWC's Extinction Initiative (IWC 2023, pp. 246-249, and the subject of dozens of SC recommendations over the years (summarized in IWC 2023, Annex Q, pp. 323-330). Here we propose an example of a *Status Summary* page using text and associated references from the draft Extinction Initiative statement. This constitutes a new proposal for ASI to consider. Note that the vaquita *Status Summary* page is more detailed and technical than the brief commentary in the corresponding pages for other species assessed above, and includes technical citations. This is due to the different nature of information available, and the suggestion that only information from outside sources that was reviewed by the SC should be included in such cases.

example: a *Stock Status Summary* page

Status of Vaquita[1]



The vaquita (*Phocoena sinus*) is found only in the waters of the northern Gulf of California, Mexico, and there may be only about 10 individuals left.[2] The most recent abundance estimates have shown a precipitous decline, and efforts to save the species have been ineffective. The species is listed as Critically Endangered in the IUCN Red List.[3]

In 1975 the IWC Scientific Committee first expressed its concerns about bycatch of vaquita in gillnets set for the similar-sized totoaba fish, and since 1991 has recognised that the low population size and relatively high rate of mortalities in fisheries was unsustainable[4]. By 2015 a monitoring program estimated a total abundance for the species of 22 to 145 individuals with a best estimate of 59., a decline of 18.5% per year [5]. In 2018 acoustic monitoring found there was only about 10 individuals remaining (uncertainty range 6-19). Over that three year period the population declined by 45% per year [4]. Given the 2018 estimate that only about 10 individuals remained, and reports showing that regulations established by the government of Mexico have been unenforced and ineffective even within the supposed 'Zero Tolerance Area' where gillnets are supposed to be banned but illegal fishing is rampant [5], it is clear that the vaquita is in immediate danger of extinction.

Incidental mortality in gillnets is the primary threat to the vaquita. Vaquitas become entangled in all types of gillnets, including those set for shrimp and finfish, but the overwhelming impact is from nets set for totoaba [6], a fish similar in size to vaquita, which has skyrocketed in value due to the black market demand for totoaba swim bladders in China. [7] The rapid

decline of the vaquita toward extinction is deeply concerning and exemplifies the challenge facing other dolphin and porpoise species living in coastal waters and struggling to survive alongside human activities, particularly fishing.

Data quality for this population is good. This status was last updated April 2022. Further details available here.

[1] Vaquita status has not been fully modeled by the Scientific Committee, and in such cases only information (including modeling conducted by outside agencies) that has been reviewed by the Committee is included in status summaries like this one.
[2] CIRVA (2019). Report of the Eleventh Meeting of the Comité Internacional para la Recuperación de la Vaquita (CIRVA). 35pp. http://www.iucn-csg.org/wp-content/uploads/2019/03/CIRVA-11-Final-Report-6-March.pdf
[3] Rojas-Bracho, L., Taylor, B.L. & Jaramillo-Legorreta, A. (2022). Phocoena sinus. The IUCN Red List of Threatened Species 2022: e.T17028A214541137. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T17028A214541137.en.
[5] Taylor, B.L., Barlow, J., Breese, D. Gerrodette, T. , ... & Yin, S. (2022). Illegal gillnetting remains a serious threat to vaquitas. Report SC/68D/SM09 presented to the Scientific Committee, International Whaling Commission. 25 April - 13 May 2022. 9pp.
[6] Vidal O (1995) Population biology and incidental mortality of the vaquita, Phocoena sinus. Report International Whaling Commission Special Issue 16: 247–272.
[7] D'Agrosa, C., Lennert-Cody, C.E., Vidal, O. (2000) Vaquita bycatch in Mexico's artisanal gillnet fisheries: driving a small population to extinction. Conserv Biol 14: 1110-9

Another potential example to be included is for Rice's whale, a newly described and isolated species in the Gulf of Mexico with an estimated abundance of only around 50 animals, for which the Committee has previously expressed serious concern (IWC, 2019, p.26; 2020, p.31; 2021, p.48). Although this stock is not one prioritized by the SOSI Steering Group, we propose a first draft example below.

example of a *Stock Status Summary* page

Status of Rice's Whale[1]

Rice's whale (*Balaenoptera ricei*), previously considered to be a geographic population of Bryde's whales,was recognized in 2021 as a distinct species found only in the northeast part of the northern Gulf of Mexico, along the continental shelf break between 100 and about 400 meters depth[2]. Previously considered a rare (and threatened) subspecies, along with species recognition came designation as likely the most threatened cetacean species, after vaquita.

In 2019, NOAA Fisheries listed the Gulf of Mexico Bryde's whale as an endangered subspecies under the Endangered Species Act (ESA).[3] In 2021, NOAA Fisheries accepted the revised taxonomic designation as Rice's whale, *Balaenoptera rice* and retains its protected status.[4] The species is listed as critically endangered in the IUCN Red List. [5]

When the comprehensive ESA status review was completed in 2016, the team of scientists conducting the review concluded that there were likely fewer than 100 individual Rice's whales throughout the Gulf, with 50 or fewer being mature individuals.[6] NOAA Fisheries' most recent abundance estimate from 2017–2018 surveys in the northeastern Gulf of Mexico is approximately 50 individual Rice's whales. [7]

The main threats are industrial and commercial activities within its habitat, including oil pollution, ship collisions, and underwater noise from seismic surveys and vessel traffic. The Deepwater Horizon platform was located outside Rice's whale habitat, but the 2010 oil spill footprint overlapped with nearly half of the whales' habitat; it is estimated that the spill reduced the population by about 20 percent.[6] The listing under the U.S. Endangered Species Act includes provisions that ban all activities that may directly harm the species within American waters; designation of a critical habitat is mandated under the Act but has not yet been established. [3]

Data quality for this population is good. This status was last updated Mar 2023. Further details about the Rice's whale are available here.

[1] Rice's whale status has not been fully modeled by the Scientific Committee, and in such cases only information (including modeling conducted by outside agencies) that has been reviewed by the Committee is included in status summaries like this one.
[2] Rosel, P.E., Wilcox, L.A., Yamada, T.K., Mullin, K.D. (2021). A new species of baleen whale (*Balaenoptera*) from the Gulf of Mexico, with a review of its geographic distribution. Mar Mam Sci. 37: 577– 610. https://doi.org/10.1111/mms.12776
[3] 50 CFR 224 (2019). Endangered and Threatened Wildlife and Plants; Endangered Status of the Gulf of Mexico Bryde's Whale. Federal Register Volume 84, Issue 72 (April 15, 2019) 84 FR 15446 –
[4] 50 CFR 224 (2021). Endangered and Threatened Wildlife and Plants; Technical Corrections for the Bryde's Whale (Gulf of Mexico Subspecies) Federal Register Volume 86, Issue 160 (August 23, 2021)
[5] Rosel, P., Corkeron, P. & Soldevilla, M. (2022). *Balaenoptera ricei. The IUCN Red List of Threatened Species* 2022: e.T215823373A208496244. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T215823373A208496244.en. Accessed on 20 March 2023.
[6] Rosel, P. E., Corkeron, P. J., Engleby, L., Epperson, D. M., Mullin, K. D., Soldevilla, M. S., Taylor, B. L. (2016). Status review of Bryde's whales (*Balaenoptera edeni*) in the Gulf of Mexico under the Endangered Species Act. NOAA technical memorandum NMFS-SEFSC ; 692. http://doi.org/10.7289/V5/TM-SEFSC-692
[7] NOAA Fisheries. Rice's whale. https://www.fisheries.noaa.gov/species/rices-whale

3.5 Adding maps and drawings to *Status Summary* pages

The potential for challenges associated with including maps to delineate population distributions was also noted in 2022 ASI discussions, including the cost of copyrights, and how existing maps might not necessarily be accurate, visually appealing, or otherwise suitable. One possibility was for ASI to approach members of the Committee who could contribute their time and technical skills to producing tailored maps in the future. It was thought that alternatives would likely require funding, although eliminating maps from the website design was also an option (IWC 2022, pp236-240). Investigation of alternatives revealed that some range maps are available through Wikimedia Commons and other open source archives (e.g. https://commons.wikimedia.org/wiki/File:Balaenoptera_ricei_range.svg) and it is likely that drawings of cetacean species contributed for the Whale Watching Handbook (https://wwhandbook.iwc.int/en/) or posted on the NOAA website (https://www.fisheries.noaa.gov/species-directory/marine-mammals) can also be obtained at no cost. The Content Development ICG recommends that range maps and drawings of cetacean species are used hereafter.

3.6 Use of the term 'stock' vs. 'population'

The Content Development ICG recommends that because of the term's history and continued use at the IWC, it is important that the history and meaning(s) of 'stock' are explained, for example on the *Glossary and Terminology* page. The term 'stock' should be avoided as much as possible on introductory pages. However, the term 'stock' is likely to be needed for more technical (practitioner level) pages and so proper usage there should be considered carefully, including in relation to use of the term in RMP documentation. The introductory level pages should use the term 'population' instead of 'stock', which is consistent with other pages of the website

which encourage users to think in terms of populations rather than species and can also be used in conjunction with other important terms (modelling, assessment, estimate, sub- etc.)

3.7 Use of the term 'Assessments'

The Content Development ICG acknowledged that this term has particular meaning in an SC context and recommends that SOSI should use the term 'assessment' where it is most appropriate but should select more specific/precise terms wherever needed/possible. The rationale for this reluctance to use 'assessment' indiscriminately is that the scientific use of the word 'assessment' (for fisheries scientists and at the IWC, an 'assessment' is a sophisticated modeling exercise) does not match the typical layperson's understanding of the word (e.g., the action of making a judgment about something (Merriam-Webster)). As replacements for 'assessment', the following terms might be used: 'modeling', 'computer simulations', 'statistical estimates'. If the term must be used in any introductory level material, there should be some explanation about the processes used in IWC modeling exercises, by pop-up link or link to the *Glossary and Terminology* page.

3.8 Time period for 'Recent Change' statistic

A time-span of 30 years for Recent Change was originally proposed during SC68C, but it was suggested in 2022 that a shorter time span of 10-20 years, or even something more specific, such as generational time for a species, might be more appropriate. Summarising over 30 years might hide informative dynamics occurring on shorter time scales, such as the very recent decline in North Atlantic right whales. At SC68D, a wide range of proposals for the 'Recent Change' statistic were discussed, from 5 years to 30 years, to 1 or 2 generations. It was also thought important that the time period may need to differ for some extreme cases. ASI agreed that the calculation would be based on a 20 year span, but that exceptions would be made as necessary. At the time of that discussion, it was pointed out that allowing exceptions would make the thermometers incomparable, thereby completely ruining the point of the *Welcome* page thermometer table. A tentative agreement was made to re-express the 20-year change as an annualized rate for the purpose of thermometer display, so the thermometers remain comparable. However, serious concerns were raised about this approach, too. Specifically, ASI noted that the importance of small Recent Change rates, and small differences between them, might not be clear to non-specialists (IWC 2023, pg 86).

At SC68D, the discussion of this issue was wide-ranging and the conclusion was rather uncertain, so intersessionally the ASI convenor asked the Content Development ICG to re-evaluate this decision. The ICG agreed that explaining an annualized rate of change and the importance of tiny differences over long time periods was cumbersome, and a simple, easily comparable middle-ground (such as cumulative change over a 20 year time span) would be appropriate for most cases and exceptions could be handled individually, but only if there were compelling reasons to do so. For example, a non-standard Recent Change computation could be converted to a 20-year span for the purpose of thermometer display. The ICG recommends that ASI reconsider and adopt a 20-year time span as the default for Recent Change, and insist that all thermometers use the same time span and numerical scale.

3.9 Choice of substock reporting for current examples

Given the decision mentioned above that results should be calculated over a 20 year interval, it was pointed out that the 'Modeling ICG' (The Status of Stocks Model-based Assessment ICG – IWC 2023, Table 2 Item 11.1.5) needs to know which groups/substocks to recompute results for. It was pointed out that the SC has agreed with ASI's recommended approach to report only on population sub-units that are of interest or concern to Commissioners or the public, in addition to one or more "overall" stocks. It was also noted that the question of which stocks to assess for SOSI is different than deciding which stocks would have abundance reported on the IWC's abundance webpage (iwc.int/about-whales/estimate) which is not part of SOSI.

3.10 Relative abundance thresholds and labels

In discussions at the 2022 meeting there was disagreement as to the extent to which the language summarizing status should adopt a 'bland' scientific tone or advocacy language. It was noted that some members of the Committee might wish to see advocacy language, particularly when stocks/populations are facing dire outcomes; others were concerned, however, that use of such language might decrease respect for the authoritative nature of the science-based results provided. In the GPA proposal, advocacy language about the vaquita was taken verbatim from past SC reports. This disagreement about tone will be particularly relevant in cases where assessment would be based more on judgment than model results (IWC 2022, pp236-240). The Commission's guidance on use of the IWC website is that content should be presented 'factually and neutrally.'

Two examples of where this issue arises are (i) developing text for cases like the vaquita, and (ii) choosing brief labels to summarize status. The vaquita example is discussed above. The issue of labels was discussed at length by the Content Development ICG.

The Relative Abundance (i.e., depletion) interval boundaries for categorizing stocks (0, 0.2, 0.4, 0.6, 0.8) have been discussed multiple times, and have been agreed by the SC. However, the labels associated with these intervals need to be decided as there is no consensus yet. The current suggestions are 0.01-0.19=[critical], 0.20-0.39=[low], 0.40-0.59=[moderate], 0.60-0.79=[good], 0.80+=[very good]. However, there are concerns about: (i) potential confusion with IUCN categories, (ii) a tone of advocacy potentially inferred by use of some terms, (iii) the fact that the RMP (and sort of, the AWMP) target 0.60 as desirable for exploited stocks, (iv) clarity and brevity since the label needs to fit below the thermometer. Discussion by the Content Development ICG did not result in a consensus recommendation. The table below lists a variety of options that received some support during discussions. The ICG recommends that ASI finalize a choice at SC69A

Table of candidate labels for abundance level ranges for considering options (not all combinations shown). Option A is the current proposal.

	0.01-0.19	*0.20-0.39*	*0.40-0.59*	*0.60-0.79*	*0.80+*
Option A	critical	low	moderate	good	very good
Option B	critical	low	moderate	high	very high
Option C	very low	low	moderate	high	abundant
Option D	critical	low	moderate	high	abundant
Option E	extremely low	low	moderate	high	abundant

3.11 Thresholds for Recent Change categories

The GPA proposal initially proposed thresholds and labels for categorizing cumulative 30-year change. These were:

≤ -25%	= 'strong decrease',
-24% to -11%	= 'decreasing',
-10% to 10%	= 'stable',
11% to 34%	= 'increasing',
≥ 35%	= 'strong increase'

The outer thresholds were based on rough equivalency to a +/- 1% annual rate of change, accumulated over 30 years, i.e. 0.75≈0.99^(30) or 1.35≈1.01^(30).

Because the Content Development ICG is recommending switching to 20-year Change, the thresholds need revision. The ICG also recognized that it was important to choose thresholds and labels that would be understood by the public and Commissioners (but noted that in cases of very sharp declines or increases some annotation or footnotes might also be required).

The ICG recommends the same quantitative reasoning for thresholds, and the same labels, as previously. For 20 years, after rounding, this amounts to the following scale for cumulate 20-year change relative to starting point:

≤ -20%	= 'strong decrease',
-20% to -10%	= 'decreasing',
-10% to 10%	= 'stable',
10% to 20%	= 'increasing',
≥ 20%	= 'strong increase'

The Content Development ICG asks ASI to endorse these thresholds and category labels.

3.12 Confidence Limits reporting

There were some questions and a suggestion that it would be good to confirm how confidence limits would be reported for Status of Stock statistics (specifically those provided in the Status Summary Table). From past communications from the computing group and notations for the table entries it was confirmed that the labels for Relative Abundance and Recent Change have been determined based on the point estimate, and the corresponding confidence limits are already displayed in the thermometers (level 1 presentation page) and the tables (level two presentation page, *Status Summary*).

3.12 Outline template for *Status Summary* page

The Content Development ICG considered how future SOSI pages would be developed. To help with that task, the ICG used the examples developed already to identify the components of the *Status Summary* and Status Details pages in outline format. The result was as follows.

Structure of *Status Summary* pages

[Title]
[Image and Range Map]
[header information on general abundance, distribution, recognized populations]
Status Results (Relative Abundance and Recent Change), with table if warranted and with trend plot(s)]

[status summary statement]
[data quality rating, and links to more info.]

Structure of Status Details pages (may be a linked web page or pdf file given in Status Summary page, or a continuation of the Status Summary page, depending on format choices discussed earlier)
- some of the same stuff as above?
- [model type used for assessment]
- [named stock structure distinctions/assumptions]
- [map showing geographic distribution of named stocks]
- [trial specifications table]
- [table of summary statistics, by relevant areas and overall, for each trial]
- [table of summary statistic medians averaged over trial (plus upper and lower bounds) for abundance, depletion, 20 year change summary statistics
- [references]

ASI may wish to evaluate whether we have missed anything important.

3.13 *Introduction to Population Status* page

The SC should assess whether this modification of an existing separate page on population status should remain, or whether the content should be woven into other pages conceived by ASI. Several sections of the draft text currently featured on the mockup page follow for individual review. This relates to the question about the point-of-entry page addressed in Section 3.1.

(link) mockup text: introducing how and why IWC assesses population status

Introduction

The IWC assesses cetacean status by population rather than by species. This is because the majority of species exist in several different areas and groups. Within a single species there may be one population that is feared to be close to extinction and one that is believed to be thriving. A good example of this is the North Pacific gray whale, considered healthy in the eastern North Pacific, but critically endangered in the west.

Within a single whale population, groups are further broken down into 'stocks.' Even within a single population some stocks may be healthy whilst others are not. For example, discussions are currently ongoing to decide whether there is cause for concern regarding one/some of the stocks that make up the population of common minke whales in the North Pacific.

In broad terms, the status of a population is assessed by comparing its current population size with either:

- the maximum size that its habitat is believed to be capable of sustaining or;
- its original, undisturbed size.

(In the case of cetaceans, the main historical 'disturbance' affecting population size was whaling activity).

The future size of the population is then predicted using computer models for mortality and reproduction, identified trends, known threats and mortalities.

(link) ***mockup text: on 'Why Population status is not easy to assess'***

Why population status is not easy to assess

Assessing population status is not straightforward. The process is challenging and must account for scientific uncertainty.

Click to learn about the challenges involved in conducting assessments.

- **It is not easy to accurately estimate the number of animals in any population because they are** constantly moving, often over large areas, and usually under water or ice. Many inhabit the world's most remote regions.
- Assessing the health of a population usually requires an understanding of the original, undisturbed size of a population prior to human activity, predominantly industrial whaling. This relies on historical data which may be incomplete or inaccurate.
- Whales are long-lived, relatively late to reach maturity, and only have one calf every 1-3 years, so assessing population trends can only be accomplished with consistent monitoring over a long period of time.
- Determining population structure, particularly for populations where the breeding grounds are unknown, is difficult.
- Biological information like mortality and reproduction rates are poorly known for most whale species. Models for how populations change over time are also only approximate

3.14 Text explaining the concept of 'scientific uncertainty'

During SC discussions in 2021 (IWC 2022, pp236-240) concern was expressed about uncertainties inherent in assessing the status of a stock, and the potential that displays of results could lead to a false impression of high precision for a reader not well versed as regards scientific uncertainty. There are considerable uncertainties, for example, in models of stock structure and hypotheses for the trials and sensitivity tests chosen for assessments. The overall conclusion about status must acknowledge this uncertainty. To address this, ASI's agreed status assessment approach integrates disparate trials, and the proposed thermometers display a range of uncertainty. The inclusion of introductory text highlighting the nature of uncertainty in science, especially as applicable to whale stock assessment, was suggested. However, the ASG also noted the public's potential misinterpretation of 'uncertainty' as 'ignorance'. Care would be needed to avoid degrading the Committee's work through an over-emphasis on uncertainty (IWC 2022, pp236-240). It was agreed that some explanation of the concept of 'scientific uncertainty' for members of the general public would be a valuable and necessary addition to the Status of Stocks webpages. A draft of such an explanation was developed by the Content Development ICG and is already featured in the draft *Introduction to Population Status* page (above). The following language is proposed.

example: draft text on 'scientific uncertainty'

> **Accounting for Uncertainty**
>
> Uncertainty is a fundamental aspect of research in almost any field of science. Whale population status assessments are subject to many uncertainties such as those described above. The data (such as abundance estimates) can only provide limited, imperfect indicators of the true state of nature.
>
> The IWC's Scientific Committee has developed a range of techniques and guidelines to assess populations and quantify uncertainty. Model-based assessments address and incorporate uncertainties by investigating wide ranges of scenarios and applying statistical approaches to quantify and account for uncertainty in model structure, data-based evidence, and assumptions. When reading about these assessments, it is important to look at the ranges of uncertainty provided, in addition to the primary estimates, in order to fully understand what we know and don't know about population status.

3.15 Text introducing SOSI

On the Secretariat's mockup point-of-entry (*Introduction to Population Status*), a prominent box highlights an explanation of SOSI. That text has not previously been reviewed by ASI (although some of it is taken from the GPA proposal), and is provided below for consideration. The use of this text is also dependent on resolution to the point-of-entry question addressed in Section 3.1.

(link) mockup text: introducing the 'Status of Populations' Initiative

> The Status of Populations Initiative aims to present its population assessments in a new format that is both detailed and clear. Additional assessments will be added annually, as they are completed and endorsed. The Scientific Committee has been developing and refining these modelling approaches for decades, producing assessments in support of a range of core, long-standing tasks including ensuring sustainable limits for aboriginal whaling and development of the Revised Management Procedure.
>
> These assessments represent the Scientific Committee's best judgment about the status of whale stocks and provide a unique, quantitative view of status.
>
> As outlined above, the Scientific Committee uses computer models to compare current population size to a chosen point in the past (e.g. prior to commercial whaling) or to an assumed maximum size that the habitat can currently sustain, and predict where is it likely to go in the future (e.g. increasing, decreasing, remaining the same).
>
> These models combine multiple direct abundance estimates with other information over many years to track population abundance over time ('trajectories').

3.16 Text explaining the status table

The Secretariat mockup also contains this version of text explaining the status table (thermometer) display. It is taken directly from the GPA proposal, except for the revision from '30-Year Change' to '20-Year Change and some minor editorial changes. The explanatory text is accessed by clicking on a link that opens up a text window with more detailed 'level two' material, e.g.:

(link) mockup text: explaining the Population Status Tables page

Click here for explanatory information about this table

The IWC Scientific Committee uses computer models to assess the status of whale populations. Status describes what the population abundance is now compared to what it was at a chosen point in the past (e.g., prior to exploitation) and where is it likely to go in the future (e.g., increasing, decreasing, remaining the same). These models combine multiple direct abundance estimates with other information over many years to track population abundance over time ('trajectories'). Thus, model estimates of abundance for a particular year may differ from the 'best' estimate from any individual survey. These modelled assessments represent the Scientific Committee's best judgment about the status of whale stocks.

The table below summarizes status using two measures from such stock assessments: Relative Abundance and 20-Year Change. Since many whale populations were severely depleted during the period of commercial whaling, the Scientific Committee usually expresses Relative Abundance as a proportion of the estimated number of whales prior to whaling, but sometimes it is expressed as a proportion of the maximum number the habitat is likely able to support ('carrying capacity'). With a changing environment, carrying capacity may change, so a reference year is sometimes specified. Usually the pre-exploitation abundance is assumed to have equaled carrying capacity then. Thus, a Relative Abundance value of 0.50 means that models indicate that the whale population is half as numerous now as it was prior to whaling, or as the habitat could now support, depending on the case.

The 20-Year Change statistic is based on model estimates of how much the whale stock size has changed over the last 20 years. Negative values mean that the stock has declined. A value near zero is not necessarily concerning: a population near carrying capacity will remain stable (near zero growth) but its status would be very good.

More details on Relative Abundance and 20-Year Change are given here. Specific details about each status assessment, including recent survey data and key concerns, are available from the indicated Status Assessment links.

3.17 ***Text on differences between IUCN and IWC 'assessments'***

Both the IWC and IUCN use the term 'assessment', but to describe very different processes with different objectives and criteria. There is, however, considerable overlap in interests and multiple areas of collaboration between IUCN and the IWC SC (IWC 2023, pg. 9), and IUCN Red List assessments are often authored by SC members who are also members of the IUCN Cetacean Specialist Group, and are routinely cited in SC documents. In 2022, an IUCN/IWC Coordination Group was created at SC68D to coordinate collaboration and communication, and that group was tasked (along with the Content Development ICG) with developing some text to explain the differences between IUCN Red List assessments and IWC population status assessments (IWC 2023, Table 4, pg. 9), their complementary nature, and why the IWC sometimes presents both. Some progress was made with developing such a statement, with a draft circulated to both groups and a few comments and edited versions exchanged, and the resulting text is already featured in the draft *Introduction to Population Status* page (above), but this would likely benefit from additional discussion to confirm that the text is agreeable to a wider range of representatives from both organizations. The Content Development ICG recommends that ASI consult with the IUCN/IWC Coordination ICG and finalise this text at SC69A.

example: draft text explaining the differences between IWC and IUCN 'assessments'

> The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species according to their risk of extinction. The system is meant to apply to all taxa – whales, birds, plants, invertebrates, even fungi – using nine status categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct. IUCN Red List assessments are essentially collections of information on current extinction risk that typically focus on entire species. However, because the range of most whale species spans huge geographic distances, a population in one location may be at a high risk of extirpation while a population of the same species in a different location is quite abundant and less threatened. The IUCN's Cetacean Specialist Group, which is responsible for drafting Red List status assessments following the IUCN Red List Guidelines, is currently working to produce more of its status assessments at the regional or "sub-population", rather than global, level. This is more akin to the IWC's approach and gives a better idea of which whale, dolphin, and porpoise populations are at the greatest risk.

3.18 Status Summary Statement

ASI has noted the difficulty of distilling a complex stock assessment down to an interpretable and scientifically defensible one- or two-dimensional metric to present to the public. For the *Welcome* page, two thermometers and single-word descriptors summarizing population status are proposed, recognizing that stock status essential boils down to how many whales are there (relative to some reference level), and how is that abundance changing? For the trajectory plots on *Status Summary* pages, it was suggested that a short, simple sentence describing the depletion, recovery and trend shown in the plot might also help convey status in plain language (IWC 2022, pp236-240). Adjacent to the trajectory plot, the *Stock Status Summary* page would include a summary statement about recovery/status (IWC 2023, pg. 237). The Content Development ICG discussed and endorsed this idea, and recommends that ASI endorse the approach, and also suggested that an even shorter text summary statement be included on the mainly graphical *Welcome* page. Proposed draft statements are shown for the *Welcome* page, *Stock Status Summary* page, and *Population Status Table* examples above. The ICG also recommends that ASI and the Secretariat consider how to reconcile these short SOSI status statements with (a) the existing population status summaries on the existing www.iwc.int website (see Section 3.2) and (b) the slightly longer status statements proposed for the SOSI *Status Summary* pages.

3.19 Procedure for terminology development

Previous discussion in ASI suggested that general explanation of the notions of "stock", "sub-stock", "feeding group", "breeding group", "unit to conserve" and so forth are needed, but no progress was made during the most recent intersessional period. Cipriano and Lang offered work together, starting with the existing terminology and definitions text that has been developed by SD, and come up with a draft of some definitions and explanations for inclusion in "pop-up" boxes and/or a glossary, for this group to review later, after the upcoming SC meeting.

During the next intersessional period, the Content Development ICG will also finalize a draft *Glossary and Terminology* page for other terms relevant to SOSI.

3.20 Data quality classification scheme with named categories

The Content Development ICG revised the draft data quality rating system from the GPA proposal. The most notable change was to include discussion of information on human induced mortality. The ICG recommends the following text.

> **Good:** At least one abundance estimate endorsed by the Scientific Committee within the last 10 years. Usually, several abundance estimates available for different years. The surveys covered, or can be reliably extrapolated to, most of the presumed stock range. Uncertainty and bias of these estimates is understood and not too large (corresponding to category 1 or 2 using the system applied in the Scientific Committee's Consolidated Table of Agreed Abundance Estimates, (IWC 2014, 2017). Stock structure is reasonably well understood or subject to a small number of competing hypotheses whose impact on assessment is not critical. The major sources of human induced mortality are understood and reasonably well quantified.
>
> **Fair:** Abundance estimates are available, but they do not meet the standards for Good. For example, survey coverage may be limited or estimation uncertainty may be high. Abundance estimates may correspond to category 3 using the system applied in the Scientific Committee's Consolidated Table of Agreed Abundance Estimates, (IWC 2014, 2017). Stock structure is poorly understood, and/or competing hypotheses have important impacts on assessment results. Nevertheless, the information available is adequate to provide some general indication of abundance. Some information about human induced mortality is available, but it may be less comprehensive and/or more uncertain than for Good data.
>
> **Poor:** Abundance estimates, if any, originate from surveys covering only a small portion of the range of the stock, are highly imprecise, or may have large and/or unknown bias. Abundance estimates have often not been reviewed or endorsed by the Scientific Committee; any endorsed estimates correspond to category 3, or worse. Little information may be available about stock structure or human-induced mortality.

The ICG noted that, although such rubrics are helpful, every case would require careful consideration of the details, so it might be useful to avoid being too prescriptive, and to add a mention that in actual practice an expert judgement approach would be applied.

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FC, GG and KW wrote this paper, building on previous work by GG, Andre Punt (AP) and the GPA proposal. AP and Cherry Allison performed the computing for results shown in the examples. We are very grateful for invaluable assistance from the Secretariat, and appreciate their support at all levels for this project. We also greatly appreciate and thank the other members of the 'Language, Terminology, and Content Development' intersessional correspondence group (Doug Butterworth, Doug DeMaster, Greg Donovan, Isidora Katara, Aimée Lang, Iain Staniland, Mark Tandy, Paul Wade, and Alex Zerbini) for their good-humored participation, comments, and suggestions.

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