

The Timeliness of Scientific Information in Support of Sustainable Management of Canada's Fisheries and Oceans

Devan Archibald and Robert Rangeley, Oceana Canada
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Introduction

Canada's marine fisheries are highly valuable: they are a major driver of our economy, shape our culture and sustain our coastal communities. Yet many of Canada's marine fish and invertebrate stocks are depleted, and less than a third can confidently be considered healthy (Oceana Canada 2019). Successful modern fisheries management requires evidence-based decision making, supported by strong science (Melnychuk 2017).

Science and evidence-based decision making have become increasingly important in recent decades in Canada (Government of Canada 2000, Council of Science and Technology Advisors 1999), including in support of the management of our fisheries and oceans (DFO 2008). The Canadian Science Advisory Secretariat (CSAS), within Fisheries and Oceans Canada (DFO), oversees the peer-review process of science related to the management of Canada's fisheries and oceans (DFO 2016). The process is intended to provide the best possible science advice to the Minister, managers, rights-holders, stakeholders and the public through rigorous peer review that is evidence-based, objective, impartial and respectful (CSAS 2011). The CSAS process is unique within the Canadian government, with no other federal departments using peer review assessments with invited external participation to develop science advice (DFO 2019). Peer review is considered a best practice for providing science advice for fisheries management, and similar processes are used in the United States (National Oceanic and Atmospheric Administration) and Europe (International Council for the Exploration of the Sea) (DFO 2019).

It is important that the management of our fisheries and oceans is transparent and that the results and advice generated from CSAS peer reviews are available to the public as soon as possible. CSAS is required to follow the Science Advice for Government Effectiveness (SAGE) Principles (CSTA 1999, DFO 2019), which include a principle on openness and transparency, stating "*The government is expected to employ decision-making processes that are open as well as transparent to stakeholders and the public, and that the public has access to the findings and advice of scientists as early as possible.*" Documents produced from the science peer-review meetings need to be published in a timely manner. Failure to do so can lead to delays in management decisions and perceptions that advice is being withheld or unduly influenced by lobbyists, tainting the credibility of the process (CSAS 2012). When science information is produced in a timely fashion to support decision making and made publicly available so that the basis of decisions is transparent, Canadians can have increased confidence in the management of our fisheries and oceans. Only then can decisions be independently evaluated in real time to ensure they promote the stability of healthy fisheries and the rebuilding of depleted stocks for the benefit of marine ecosystems, coastal communities and the fishing industry.

Last year, Oceana Canada evaluated the timeliness of the availability of scientific information to support the management of Canada's fisheries and oceans from CSAS meetings held in 2017 (Oceana Canada 2018). The results were startling, with only about 10 per cent of expected publications from CSAS meetings published within CSAS policy timelines, almost half published late, and more than 40 per cent of expected documents not available.¹ DFO initiated an internal evaluation of the CSAS process between March 2018 and January 2019 (DFO 2019). Generally, it found that CSAS is valued and well respected, but DFO identified several opportunities to improve the science advisory process, including the timeliness of the availability of science advice. To determine if 2017 was simply an anomaly and if improvements have been made, this current Oceana Canada report evaluates the timeliness of the availability of scientific information from CSAS meetings held in 2018,

¹ As of July 1, 2018.

updates the 2017 results and discusses the findings in light of DFO internal evaluation findings and recommendations.

Background

Requests for advice to CSAS are reviewed, assessed and prioritized based on risks, and the schedule is finalized prior to the start of the new fiscal year so scientists and managers can develop workplans and make necessary resource allocations (CSAS 2012). Participants are chosen for their knowledge of the topic under review (e.g., species, modeling) (CSAS 2011), and meeting conclusions and final scientific advice are reached by consensus (CSAS 2010a). Documents produced from the science peer-review meetings need to be published in a timely manner (CSAS 2012).

The CSAS currently produces four types of publications resulting from its meetings (CSAS 2010b):

1. Science Advisory Reports: These outline the peer-reviewed scientific advice that was developed through the consensus of meeting participants. These documents contain a synopsis of the evidence in support of the advice but lack specific details on the scientific analysis. As per policy guidelines, they should be published within approximately 10 weeks from the end of the meeting (CSAS 2012).
2. Research Documents: These outline in detail the scientific studies and analyses that were peer reviewed during the meeting and are based on working papers that are produced before the meeting. These documents contain all the detail required for other scientists to review, critique or replicate the research. As per policy guidelines, they should be published less than five months from the end of the meeting (CSAS 2012)
3. Proceedings: These outline the discussions that occur during a peer-review meeting and list who participated and their affiliations. These documents contain the relevant details of any concerns expressed by participants about methodology, alternate interpretations of the scientific analysis or resultant advice. As per policy guidelines, they should be published less than five months from the end of the meeting (CSAS 2012).
4. Science Responses: These outline the scientific advice and proceedings from meetings convened to address urgent and unforeseen reviews undertaken under the Science Response Process (SRP). SRPs are less thorough review processes (i.e., internal peer review; no external reviewers) held in response to urgent and unforeseen issues or where a fully inclusive and thorough science peer-review meeting is not required because such a meeting has already developed a framework for the issue (CSAS 2016). These documents contain a synopsis of the evidence in support of the advice but lack specific details on the scientific analysis. As per policy guidelines, they should be published within approximately 10 weeks from the end of the meeting (CSAS 2012).

Multiple publications are often expected from each meeting. There are no requirements on which types need to be published, but given their differing, yet complementary, content, peer review meetings should always require the publication of a Science Advisory Report, Research Document and Proceedings. SRPs, which are often urgent and have less thorough review processes, should always result in the publication of a Science Response, at a minimum.

Generally, there are two steps in the publication process: 1) submission of draft reports to CSAS by authors and 2) formatting of reports and publication by CSAS. Following meetings, the meeting Chair is responsible for ensuring Science Advisory Reports (or Science Responses) and Proceedings are finalized, reviewed and/or approved by participants before submitting the documents to the appropriate regional CSAS office or the CSAS Secretariat (DFO 2019). The science lead is responsible for ensuring that Research Documents are finalized with any updates discussed during the peer review and submitted to the appropriate regional CSAS office for publication. Once documents are received, CSAS staff ensure they are complete, formatted as required and available in both official languages for publication. Regional CSAS offices then submit all documents to the

Secretariat for publication. The Secretariat publishes all submitted documents on the CSAS website, ensuring that the science advice is publicly available (DFO 2019).

Methods

To assess the timeliness of recent scientific information in support of fisheries and oceans management in Canada, Oceana Canada examined all CSAS meetings held in 2018, and evaluated the ensuing publications produced against expected publications and CSAS publication policy deadline guidelines (CSAS 2012). The CSAS schedule website, publication search and spreadsheet export tools (DFO 2016, 2018) were used to determine how many processes resulted in the publishing of all expected publications within expected timelines, how many resulted in publications published late and how many still had publications forthcoming as of July 1, 2019.² To determine the focus of meetings, broad taxon (e.g., invertebrate, groundfish) and subject area category (e.g., population assessment, habitat and biodiversity) were assigned to each meeting. The same methods were used to update progress on outstanding publications from 2017 CSAS processes evaluated last year (Oceana Canada 2018).

The CSAS schedule and corresponding exported spreadsheet lists expected publications for each CSAS meeting. These were used to assess if all expected publications were published. The CSAS schedule website is updated with links to publications when they become available. In this analysis, if unexpected publications were published, they were assumed to have been expected, even if they were not listed as expected on the CSAS schedule website or exported spreadsheet (as they are often removed from the expected list once published). In 2017 this was most often the case for SRPs, where there was often no expected publication listed and it was assumed a Science Response report was the only expected publication unless otherwise noted by CSAS. Similarly, in 2017, for external peer-reviewed processes (both Regional and National) when no expected publications were listed, it was assumed that at least one Research Document was expected to be published. Making these assumptions was unnecessary in 2018 because the list of expected publications included at least one document for all processes that still had not produced publications. In both years, if a meeting was postponed it was excluded from the analysis.

Document publication dates, as they appear in exported spreadsheets from the results of CSAS publication searches, were compared to the CSAS policy on timelines for submission and publication of documents to evaluate the timeliness of publications produced (CSAS 2012). The policy outlines the timelines for submission of documents to CSAS by report authors after processes have been completed (CSAS 2012). It also outlines timelines for CSAS to finalize, format, translate and post documents online once received (CSAS 2012). Because only meeting end dates and document publications dates are publicly available, these timelines were merged.

The policy indicates Research Documents and Proceedings should be submitted to CSAS as soon as possible and at the latest within four months of the end of the meeting. These document types should be posted as soon as possible and within three weeks of reception of the final documents by CSAS. Therefore, these document types were evaluated as being published on time when they were published within 145 days³ of the meeting end date. Science Advisory Reports and Science Response reports should be submitted to CSAS as soon as possible and at the latest within eight weeks of the end of the meeting. These document types should be posted as soon as possible and within two weeks (10 working days) of reception of the final document by CSAS. Therefore, these document types were evaluated as being published on time when they were published within 70⁴ days from meeting end date.

² July 1, 2019 is more than one month past the longest deadline for publication under CSAS policy for meetings held in late December 2018.

³ (4 months x 31 days/month) + (3 weeks x 7 days/week) = 145 days

⁴ (8 weeks x 7 days/week) + (2 weeks; i.e., 2 weeks x 7 days/week) = 70 days

Results

In both years (2017 and 2018) the number and types of meetings were similar (Figure 1). In 2018, 130 CSAS meetings were held, 56.2 per cent of which were external peer-review processes (73 meetings), with the rest primarily SRPs (55 meetings). In 2018 there were two meeting types not held in 2017: one Science Special Response Process (SSRP) was held,⁵ presumably similar to an SRP, and one advisory meeting was held.⁶

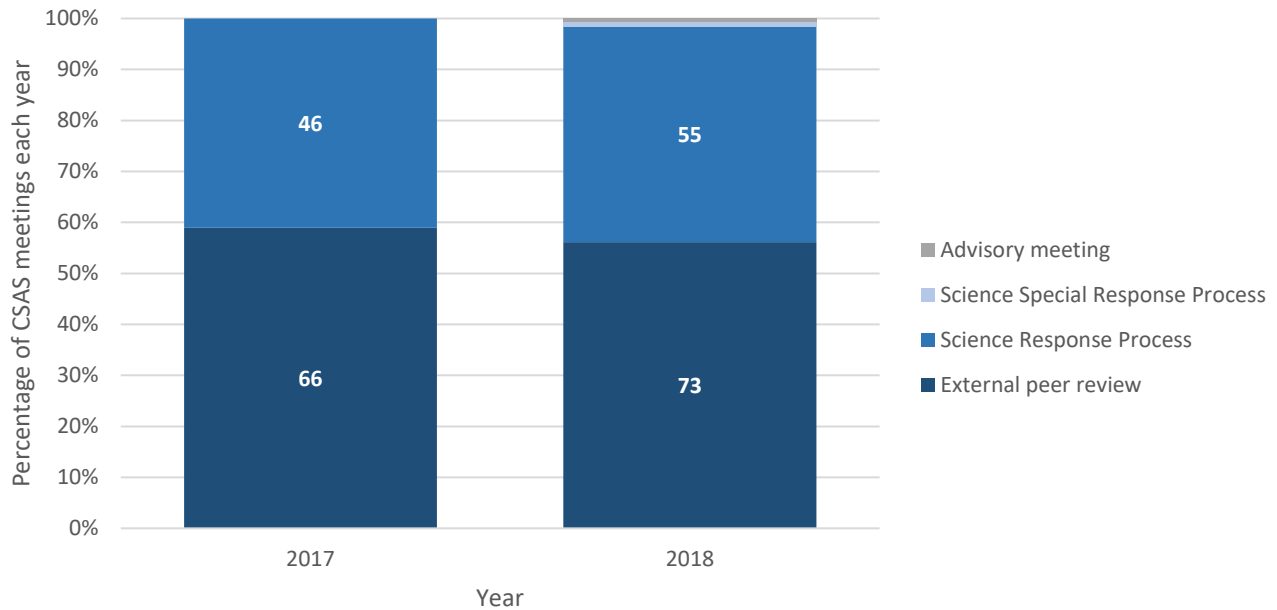


Figure 1. The percentage of Canadian Science Advisory Secretariat (CSAS) meetings held in 2017 (n = 112 meetings) and 2018 (n = 130 meetings) belonging to each meeting type. The number of meetings in each category is indicated in white font within the bars. In 2018 there was one Science Special Response Process and one Advisory meeting held by CSAS. Neither of these meeting types were held in 2017.

In both years the subject matter of meetings was also similar (Figure 2). In 2018 most meetings pertained to population assessments of invertebrates (22 per cent or 28 meetings), followed by meetings involving assessments of diadromous fish (11 per cent or 14 meetings) and groundfish (10 per cent or 13 meetings). Several meetings involved multiple taxa and pertained to subject matter other than population assessments or habitat and biodiversity (9 per cent or 12 meetings).

⁵ Limit Reference Points for Atlantic Salmon Rivers in Salmon Fishing Areas 15 to 18, DFO Gulf Region on February 8, 2018

⁶ Review of risks and benefits of Collaboration for Atlantic Salmon Tomorrow's (CAST) Smolt-to-Adult Supplementation (SAS) Experiment Proposal from January 22 to 23, 2018.

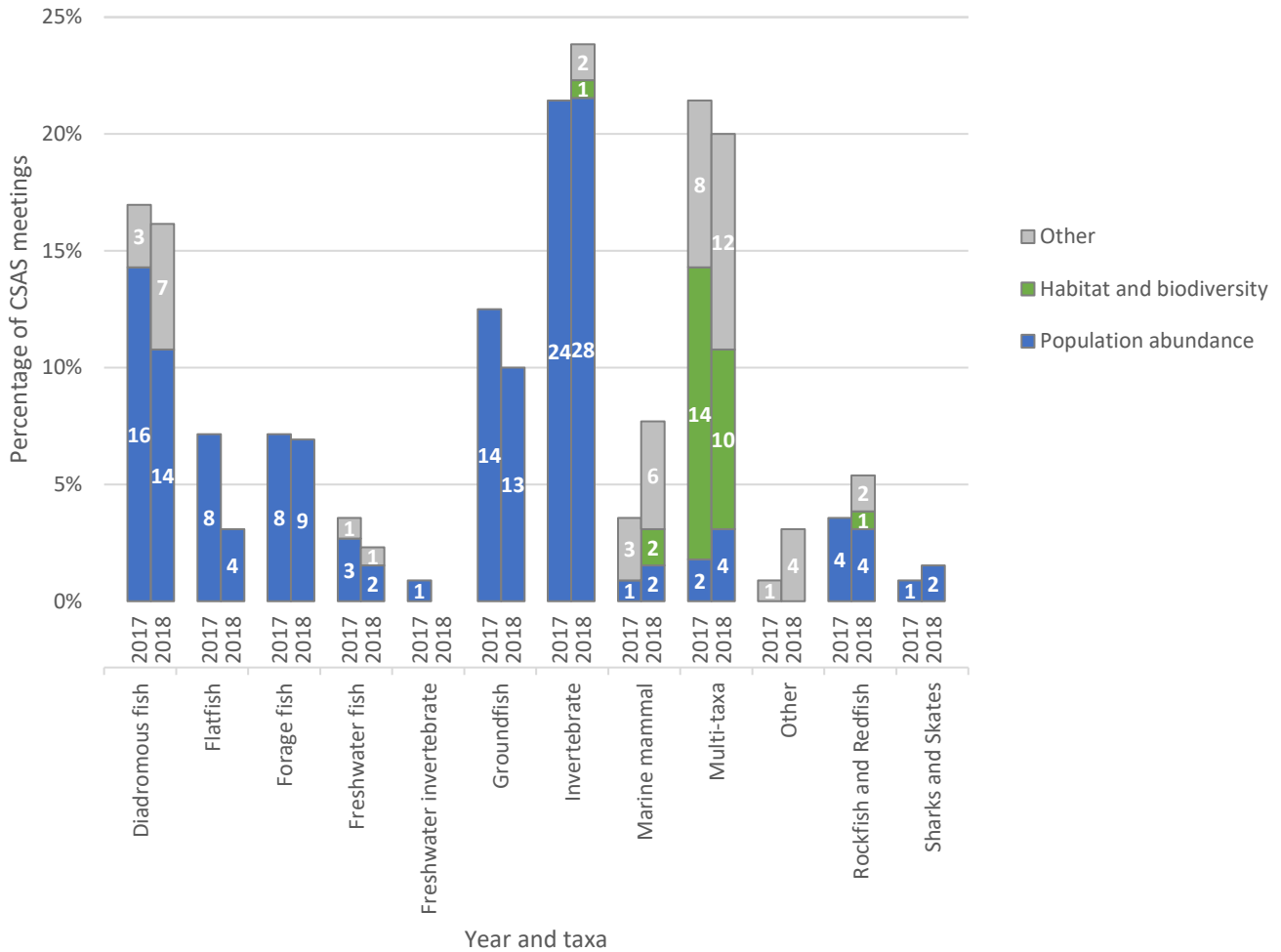


Figure 2. The percentage of Canadian Science Advisory Secretariat (CSAS) meetings held in 2017 (n = 112 meetings) and 2018 (n = 130 meetings) that pertained to population abundance, habitat and biodiversity or other subject matters among different taxonomic groups. The number of meetings in each category is indicated in white font within the bars.

Overall, meetings in 2018 were slated to produce a combined 282 documents, more than that expected from 2017 meetings, where 245 documents were expected to be published⁷ from fewer meetings. In 2018, only 9.2 per cent of documents (26 documents) were published within CSAS policy timelines, 33.3 per cent (94 documents) were published late, and 57.4 per cent (162 documents) are not yet available. These results are similar to the overall timeliness of document publication for 2017 meetings that Oceana Canada reported last year. Since then,⁸ 36 documents pertaining to 2017 meetings were published, increasing the percentage published late from 45.6

⁷ According to Oceana Canada’s 2018 report, 239 documents were expected from CSAS’s 2017 meetings. This report revises that number to 245 because additional documents have since been published that were not on CSAS’s list of expected documents.

⁸ Since last year’s inclusion cut off of July 1, 2018 until the inclusion cut-off of July 1, 2019 used here.

per cent⁹ to 59.6 per cent (146 documents) and decreasing the percentage still not published from 43.5 per cent⁹ to 29.8 per cent (73 documents). The percentage published on time within CSAS policy timelines remained about the same (10.6 per cent⁹ or 26 documents).

In both years combined, documents that were late were published on average 163 days (minimum 1 day; maximum 690 days; median 113 days) after CSAS policy timelines indicates they should have become available (see Table 1 for a breakdown by document type). Over all documents that were published (either late or on time in both years), it took on average 225 days after the meeting end date (minimum 6 days; maximum 835 days; median 177 days) until they were publicly available (see Table 2 for a breakdown by document type). Multiple documents are often expected for each meeting, with 2.2 documents expected on average (minimum one; maximum 12; median two) in both years combined.

In both years, timeliness varied by document type. Most Science Advisory Reports and Science Response reports were published, albeit with the majority late, while Proceedings are still not available from most meetings held in either year (Figure 3). More Research Documents expected from meetings held in 2018 remain unpublished (79.8 per cent) as compared to those expected from 2017 meetings at this time last year (66 per cent unpublished). Updating the 2017 dataset resulted primarily in more Research Documents becoming available (n = 22 documents), followed by Science Advisory Reports (n = 9 documents), Proceedings (n = three documents) and Science Response reports (n= two documents).

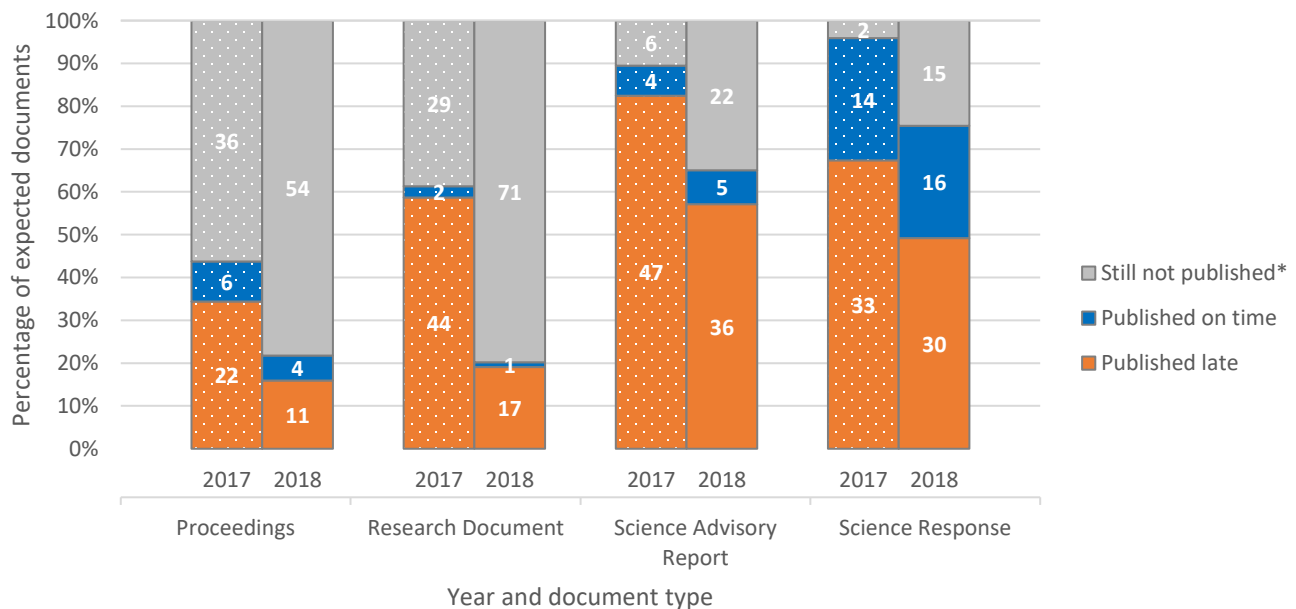


Figure 3. The percentage of documents for each of the four document types expected to be published as a result of Canadian Science Advisory Secretariat (CSAS) meetings held in 2017 (n = 112 meetings; n = 245 expected documents) and 2018 (n = 130 meetings; n = 282 expected documents) and that were published within and outside of CSAS policy on timelines, as of July 1, 2019. The number of documents in each category is indicated in white font within the bars. Please note that the 2017 values are the updated results obtained this year, as indicated by white dots within bars. Because an additional year has

⁹ The percentage of documents published late, still to come, or on time from CSAS meetings held in 2017 are slightly different than that reported last year (on time; 9.2 per cent or 22 documents, late; 47.3 per cent or 113 documents, still to come; 43.5 per cent or 104 documents) because a few minor errors in publication date format were corrected (n = 25 documents) in the dataset used for this analysis. Further, the percentages reported this year after the update also have a new denominator because the number of expected documents is higher, as some documents published since last year were not listed as expected.

*passed, allowing more time for the inclusion of documents published late, they are not directly comparable to 2018 values. Please see the text and Oceana Canada (2018) for 2017 values at this time last year. *As of July 1, 2019.*

In 2018, only 9.2 per cent of all meetings (12 meetings) had all their documents published within CSAS policy timelines, 53.8 per cent (70 meetings) had at least one document published late and 31.5 per cent (41 meetings) still do not have any documents available. At this time last year, there were similar percentages of 2017 meetings having all documents published on time (11.6 per cent or 13 meetings).

No external peer-review meetings held in 2018 resulted in the publication of *all* expected documents within CSAS policy timelines. In the case of 58.9 per cent (43 meetings), at least one document was published late. Meanwhile, we are still awaiting the publication of at least one document from 86.3 per cent (63 meetings). Similar to last year's findings, about one-third of external peer-review meetings held in 2018 that were expected to produce Science Advisory Reports have yet to do so (22 out of 62 meetings). For both years, the majority of the reports published were published late. Similarly, most meetings from both years have yet to publish expected Research Documents and Proceedings (Figure 3).

About one-third of external peer-review meetings held in 2018 (32.9 per cent or 24 meetings) still have not produced a Science Advisory Report or a Research Document available to the public that summarizes the scientific evidence of management advice. Based on the updated number of expected documents this year, nine external peer-review processes held in 2017 also still have not produced a Science Advisory Report or a Research Document that is publicly available. These are now long overdue. More than half of these meetings held in the last two years that have still not made their science advice publicly available pertained to assessments of population abundance (17 meetings), either in support of fisheries management (12 meetings) or the evaluation of potential species at risk (five meetings).¹⁰

The situation is a little better for SRPs, which involve urgent and unforeseen meetings with less thorough review processes (i.e., internal peer review; usually no external reviewers). A quarter (25.0 per cent, 14 meetings) of SRPs and SSRPs held in 2018 produced all expected documents within CSAS policy timelines. There was, however, a large increase in SRPs with documents yet to be published. At this time last year, only 8.7 per cent (four meetings) of SRPs from 2017 had yet to produce documents. This year, 44.6 per cent (15 meetings) of SRPs and SSRPs from 2018 still have documents yet to be published. Over half of the 2018 SRPs and SSRPs that have not produced publicly available science advice pertained to assessments of population abundance in support of fisheries management (eight meetings).

¹⁰ i.e., in support of Committee on the Status of Endangered Wildlife in Canada assessments

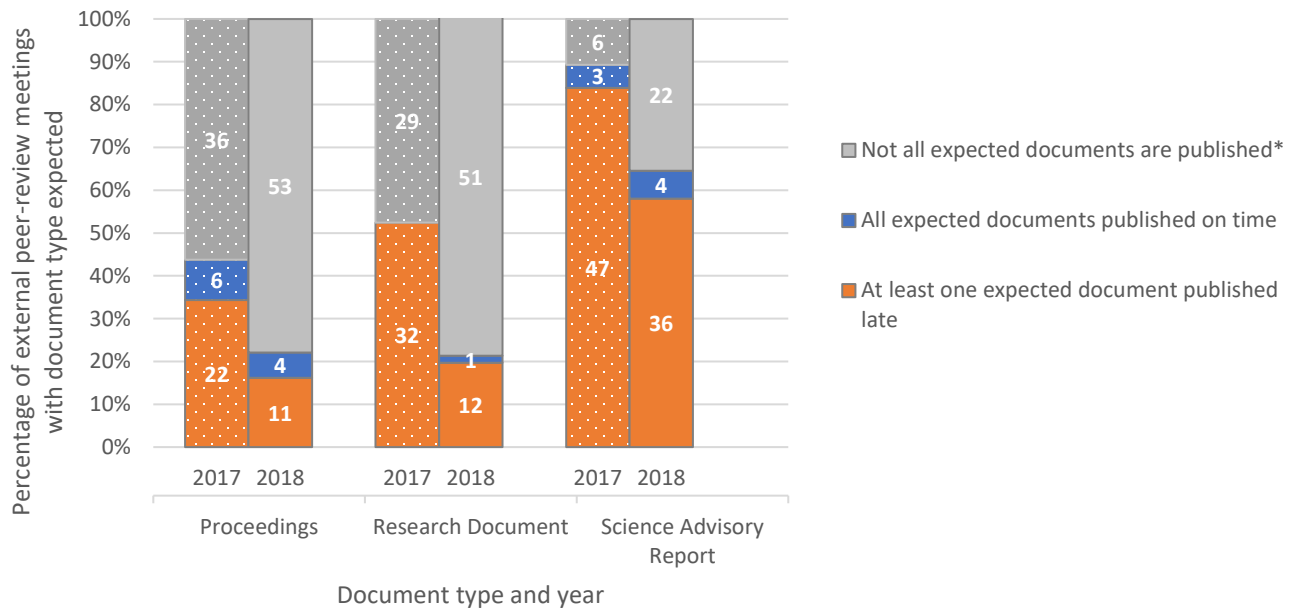


Figure 4. The percentage of Canadian Science Advisory Secretariat (CSAS) external peer-review meetings held in 2017 (n = 66 meetings) and 2018 (n = 73 meetings) with expected documents for each document type that were published within and outside of CSAS policy timelines as of July 1, 2019. Please note that the 2017 values are the updated results obtained this year, as indicated by white dots within bars. Because an additional year has passed, allowing more time for the inclusion of documents published late, they are not directly comparable to 2018 values. Please see the text and Oceana Canada (2018) for 2017 values at this time last year. The number of meetings in each category is indicated in white font within the bars and may not add up to the total number of meetings since not all meetings were expected to produce all document types. The sum of percentages does not always equal 100 per cent for all document types in each year as there can be some overlap in categories. For example, if a given meeting had at least one document published late and still has some expected documents of the same type not yet available, the total will be higher than 100 per cent. *As of July 1, 2019.

Discussion

CSAS oversees the peer-review process of science related to the management of Canada’s fisheries and oceans (DFO 2016). The resultant CSAS publications are the main source of scientific information about our oceans and their inhabitants. This formalized science peer-review process and transparency created by making documents publicly available is an exception among science-based federal departments (DFO 2019). Operation of CSAS as intended is therefore important not only to successfully manage fisheries and oceans but also to maintain the standard CSAS sets for other federal departments in the provision of science advice.

CSAS policy states that delays in producing documents can result in delayed management decisions and create the impression that advice is either being withheld or influenced, which in turn can undermine the credibility of the process (CSAS 2012, DFO 2019). Thus, it is concerning that only about 10 per cent of expected publications from CSAS meetings held in each of 2017 and 2018 were published on time and within CSAS policy timelines. In 2018 overall publication rates (on time and late publications combined) were more than 10 per cent lower than last year, with less than half of all expected documents published (42.5 per cent published; 9.2 per cent on time, 33.3 per cent late) as compared to just over half of expected documents from 2017 meetings published at this time last year (56.2 per cent published; 10.6 per cent on time, 45.6 per cent late).

Similar results were found when publications were examined by meeting. Only about 10 per cent of meetings had all their documents published within CSAS policy timelines in each of 2017 and 2018. In 2018, no external peer-

review meetings had all expected documents published within CSAS policy timelines and about one-third still do not have a Science Advisory Report or a Research Document available to the public to summarize the scientific evidence behind management advice. After the update this year, there are still nine external peer-review meetings from 2017 that also do not have these document types available, making these documents long overdue. Over half of these meetings held in the last two years that have not yet made science advice publicly available pertained to assessments of population abundance, either in support of fisheries management or to evaluate potential species at risk. Clearly, there is room for improvement in the timeliness of the publication of science in support of fisheries and oceans management in Canada and resultant transparency of the evidence supporting those decisions.

An internal DFO evaluation of CSAS found similar results in its analysis of the timeliness of publications from meetings held between fiscal year 2013/14 and 2017/18 (DFO 2019). When they analyzed all the meetings held over these years, they found only 77 per cent of expected documents were published, two per cent are with CSAS but are not yet published and 21 per cent have yet to be submitted to CSAS for publication. The internal evaluation, with access to information internal to DFO, was able to break down analysis of timeliness based on stages of the publication process: 1) submission to CSAS by authors and 2) CSAS formatting and publishing reports on the website once drafts are received. The evaluation found that most documents (62 per cent) were not submitted to CSAS within the required timelines as per CSAS policies and once received, most documents (66 per cent) were not published by CSAS within the required timelines. The internal DFO evaluation also found differences among document types at each step in the process. In terms of submission compliance, Science Advisory Reports and the Research Documents had the lowest compliance rates (26 per cent and 38 per cent submitted on time, respectively). In terms of publication, once received by CSAS, Science Advisory Reports and Science Response reports had the lowest compliance rates (29 per cent and 32 per cent published on time, respectively). Evidently, both steps of the process require improvement.

Reasons for Delays in Submission of Documents from Scientists to CSAS

The internal DFO evaluation of CSAS discusses several challenges impacting submission compliance rates (DFO 2019). Requirements outlined in federal government and CSAS policies and procedures for web publications were the main factors identified as impacting submission timelines as they can require significant time to meet. Examples of compliance requirements include formatting documents and ensuring they conform to web accessibility standards. The evaluation also indicated that a new CSAS policy on the translation of documents implemented on April 1, 2018 was noted by participants as being one of the main factors delaying the submission of documents, as compliance requires significantly more time than what was originally conceived when the policy on timeliness was drafted (CSAS 2018). Prior to this new policy, only abstracts of Research Documents and Proceedings were published in both French and English, whereas the new policy requires the entirety of all documents to be published in both languages (CSAS 2018). This factor is likely related to our finding here that about 10 per cent more Research Documents expected from meetings held in 2018 remain unpublished (79.8 per cent) as compared to those expected from 2017 meetings at this time last year (66 per cent unpublished). But it would not have influenced the compliance rates found in the internal evaluation, since the policy was implemented after the meetings analyzed. Regardless, it is likely to influence timeliness moving forward, but it is important that CSAS documents used in the decision-making process are available in both French and English. It is important that budgets allocate enough funds for translation services¹¹ and submission practices are adjusted for Research Documents and Proceedings to incorporate the additional time required for translation.

Other factors influencing submission compliance rates identified in the internal evaluation included the workload of CSAS staff and scientists and perceptions that participation in the CSAS science advisory process does not

¹¹ This may require increasing the overall CSAS budget, given that this change, combined with the recent requirement to use the Translation Bureau for translation services, is expected to increase the annual translation costs for CSAS from \$263,310 to \$1,068,486, or about 49 per cent of the current overall CSASS budget (DFO 2019).

support career development (DFO 2019). Scientists participating in the evaluation noted that completing CSAS documents is a cumbersome process, which further constrains their workload and impacts their ability to engage in other research-related activities. Thus, they sometimes choose, or are forced, to forgo completing CSAS documents if they are required to turn their attention to tasks put on hold during the CSAS process (DFO 2019). The evaluation also noted that some scientists do not consider participation in CSAS meetings or the completion of the resulting documents as contributing towards their career progression, resulting in lowering the priority for document completion (DFO 2019). To address this issue, the evaluation recommended that CSAS, its regional offices and senior management in the Ecosystems and Oceans Science sector collaborate to dispel myths that participation in the CSAS science advisory process does not contribute towards career progression.

Reasons for Delays in Publication of Documents by CSAS

Low publication compliance rates were primarily attributed to a lack of human resources and requirements related to external notifications and approvals (DFO 2019). There are several vacant positions within CSAS, resulting in a lack of capacity to support the publication of CSAS documents. CSAS staff have other responsibilities in addition to publishing documents, and while they do their best to complete all tasks within required timelines, it is sometimes not feasible, particularly when multiple documents are submitted for publication within a short time period. Furthermore, sometimes documents are received that are unformatted or only partially formatted, and CSAS staff must work with scientists to finalize them or in some cases finalize the documents themselves. This can significantly impact the workload of CSAS staff, particularly in understaffed offices (DFO 2019). Publication delays may also occur for reasons external to CSAS, such as the approval process related to media coverage connected to some reports, requirements to provide senior management two weeks' notice before documents are published and the need to have electronic documents approved by the regional CSAS offices (DFO 2019).

To address submission and publication compliance issues, the internal DFO evaluation of CSAS recommended a review of the Ecosystems and Oceans Science sector to identify the capacity required to address the workload around both submission and publication of CSAS documents (DFO 2019). Considering that in the last few years DFO undertook the largest science recruitment campaign in its history (DFO 2017), the identification of a lack of capacity is somewhat surprising. It may be more an issue of allocation of funds and staff versus sheer numbers of staff, or perhaps the recent hires have simply brought DFO Science back to a functioning level after years of increasing demands for scientific information and advice that coincided with fixed or declining capacity in the early 2000s (DFO 2008). Regardless, the number of vacant positions is clearly a capacity issue within the CSAS offices that needs to be addressed as soon as possible to facilitate timely dissemination of science information and advice in support of fisheries and oceans decision making.

The internal DFO evaluation of CSAS also recommended revisiting and extending publication timelines. It indicated that extended timelines may help mitigate capacity issues until vacant positions can be filled and would allow for notifications to and approvals from senior management. Science Advisory Reports and Science Response Reports are supposed to be published within 10 business days of submission according to current CSAS policy timelines (CSAS 2012), but senior management requires two weeks' notice before documents are published (DFO 2019). These requirements do not align and leaves essentially no time for formatting and translation. The evaluation expects that extended timelines could also provide the individuals responsible for completing the documents the flexibility to complete them while also addressing competing or new tasks (DFO 2019). The evaluation indicates that the recommendation is intended to increase compliance rates by considering activities that were not originally required and that timelines should be reviewed in consultation with scientists and CSAS clients (e.g., managers) (DFO 2019). It also reiterates the importance of considering the best practice of ensuring documents are publicly available in a timely manner (DFO 2019). If timelines are to be extended, it should be done after careful review and not result in publication timelines extending beyond current realized rates, particularly for Science Advisory Reports and Science Response reports heavily relied upon during decision

making. These document types should be available prior to decision making, and preferably available during discussions surrounding decisions with rights-holders and stakeholders.

Improvements to the Communication of Science Advice

The internal DFO evaluation of CSAS found that about a third of the time CSAS documents are not received by clients (e.g., managers) within required timelines, limiting the extent to which advice can be used for management decisions (DFO 2019). When documents are unavailable, managers often use draft versions but are uncertain as to what extent drafts can be used or shared, given that they are not published (i.e., publicly available). Similarly, although many of the same people involved in decision making are often present when scientific evidence is reviewed at CSAS meetings¹² and are thus armed with scientific information even if the publication of it is too late for decisions, if the publication of the final wording of advice is not available on time, it could create an imbalance between those involved in decision making who were present during CSAS processes and those who were not. The internal DFO evaluation noted that participants emphasized that they would like more interactive forms of knowledge dissemination embedded within the science advisory process to further support the use of the science advice within DFO, as well as among stakeholders and the general public (DFO 2019). The evaluation revealed that over half of scientists are already supporting clients (e.g., managers) as they use the advice in the decision-making process, indicating there are opportunities to improve the science–policy interface (DFO 2019).

The evaluation recommended technical briefings to enhance and support the use of science advice (DFO 2019). Technical briefings would be between the scientists and the client(s) following the meeting. They would allow the clients to ask questions and to confirm their understanding of the science advice before using it in the decision-making process and for scientists to learn how their information is used. The evaluation indicates it could be an opportunity to review and discuss the draft science advice before it is finalized and submitted for publication. It is somewhat surprising that technical briefings within DFO are not already occurring between scientists and managers, but perhaps formalizing the process would ensure it occurs and enhance the use of science advice. However, care should be taken such that the science advice does not change because of the post-peer-review internal briefings, which could undermine the credibility of the CSAS processes. Some regions are already holding external technical briefings of final science advice after high-profile meetings (e.g., Northern cod stock assessment) with management, and rights-holders and stakeholders, as well as additional briefings with media. This is an excellent means to ensure the advice is available to the public quickly, and it should continue but is likely not feasible for every meeting. Scientists also often present summaries of CSAS meetings to advisory committees, which is also good practice and should continue, but often occurs the day advice is sought from members, limiting its utility if presented without preceding documentation. To support external technical briefings and fair and transparent decision making, finalized summary bullets with the list of meeting attendees and affiliations could be officially published on the CSAS website as soon as possible and prior to briefings to allow attendees time to process the information and prepare questions. Multiple modes of communicating science advice, well in advance of final decision making, is recommended but should not replace timely receipt of the detailed scientific evidence found in CSAS documents.

The evaluation also recommended a standardized approach for disseminating the final versions of CSAS documents to clients, particularly Science Advisory Reports and Science Response reports, as another solution to enhance and support the use of science advice (DFO 2019). It noted that while some clients receive documents directly from the Chair, the science lead or the CSAS office, others indicated that they only become aware that final versions of the document were available when they find them on the CSAS website. This is a passive form of communication that requires interested parties to seek out publications of interest (DFO 2019). A standardized approach that actively engages end-users would be welcomed. All meeting participants and members of relevant

¹² During CSAS processes participants are invited for their expertise and are expected to be objective and not act as advocates or representatives of their interest group (CSAS 2011).

advisory boards should be notified when final versions of documents are available, which is easily accomplished via email. Additionally, the CSAS office could provide a listserv to which interested parties could sign up to receive monthly updates of new publications.

Another possibility to improve compliance would be to streamline the document types published to reduce workload and translation costs. The DFO response to the evaluation findings included the development of new national standardized procedures and products by December 2020, even though altering the document types was not included as a recommendation of the evaluation report (DFO 2019). Due to the differing content of each publication type (see Background, above), it is difficult for those not present at meetings to truly evaluate the scientific evidence until all publication types are available. Although Science Advisory Reports provide a summary of key evidence and advice, the information required to truly evaluate the analysis and replicate results if necessary is not available until Research Documents are published. Moreover, concerns expressed by meeting participants about the analysis or the interpretation of findings, as well as the list of meeting participants (and affiliations) are not available until Proceedings are published. The internal evaluation of CSAS found that documents produced by CSAS are used by most survey respondents (>75 per cent) to support their work, and that Science Advisory Reports and Science Response reports are used throughout the decision-making process (DFO 2019). Several people interviewed or included in surveys conducted during the evaluation also noted that they use Research Documents and appreciate having access to detailed information on the data and analysis that informed the science advice available publicly during the consultation process for transparency reasons (DFO 2019). Few people noted use of Proceedings (DFO 2019). Because of their complementary content, all document types should continue to be produced. That said, if the department must streamline the number of document types published, it may be possible to cease the production of Proceedings if dissenting views and the list of meeting participants and affiliations are captured in Advisory Reports. Advisory Reports and Research Documents should continue to be produced. Although the latter likely take more time, they are supposed to be based on working papers produced before meetings (CSAS 2010b) and thus should only require revisions afterwards. The improvements to incentives for scientists to participate in CSAS processes and publish CSAS documents discussed above should help improve publication rates and timeliness of Research Documents.

Summary and recommendations

Successful modern fisheries management requires evidence-based decision making that is supported by strong science (Melnychuk 2017). CSAS, within Fisheries and Oceans Canada, oversees the peer-review process of science related to the management of Canada's fisheries and oceans (DFO 2016). The process is intended to provide the best possible science advice to decision makers. When science information is produced in a timely fashion to support decision making and made publicly available so that the basis of decisions is transparent, Canadians can have increased confidence in the management of our fisheries and oceans. Only then can decisions be independently evaluated in real time to ensure they promote the stability of healthy fisheries and the rebuilding of depleted stocks for the benefit of marine ecosystems, coastal communities and the fishing industry.

Unfortunately, Oceana Canada found very low compliance with the CSAS policy timelines (CSAS 2012). For publications expected from CSAS meetings held in 2017 and 2018, only about 10 per cent of expected publications were published on time and only about 50 per cent were published at all. An internal DFO evaluation of CSAS also found similar issues with the timeliness of science advice (DFO 2019). It found that CSAS is generally valued and well respected, but it identified several opportunities to improve the science advisory process, including the timeliness of the availability of science advice. As recommended by the evaluation, DFO should review timeline targets and develop mechanisms to increase compliance rates for the submission and publication of CSAS documents. Timelines should only be extended after careful review and not result in publication timelines extending beyond current realized rates, which are already inadequate. Multiple modes of communicating science advice, well in advance of final decision making, is recommended, but this should not replace timely receipt of the detailed scientific evidence found in CSAS documents. It is expected this review of

timelines will occur as part of a larger review of the entire CSAS process that addresses all recommendations made by the internal evaluation (DFO 2019). In the evaluation report, DFO indicates that it will develop and approve new national standardized procedures and products by December 2020 and that CSAS will incorporate the new guidelines in the planning process for an inaugural multi-year call for advice in January 2020 (DFO 2019).

With recent declines in the health status of several marine fish and invertebrate stocks (Oceana Canada 2019) and an uncertain future in the face of climate change, addressing issues in the CSAS process now is of utmost importance. Requests for advice from CSAS are likely only going to continue to increase, as has been the case in recent years (DFO 2019). Canada's fisheries and oceans management is based on science, and the timely delivery of science advice is required to support the stability of healthy fisheries and the rebuilding of depleted stocks for the benefit of marine ecosystems, coastal communities and the fishing industry. The reasons for delays must be addressed and corrected, and Oceana Canada recommends the following actions to help make improvements:

- Allocate enough funds for translation services to ensure all document types can be published in both official languages, so that lack of funding for translation services does not restrict the publication of documents
- Educate scientists about the importance of the CSAS process and ensure performance reviews provide incentives to participate in meetings and publish documents
- Fill vacant CSAS staff positions to reduce the workload in CSAS offices and immediately facilitate more timely dissemination of science information and advice
- Allocate funds to increase the capacity of the Ecosystems and Oceans Science sector to address the workload around both submission and publication of CSAS documents
- When reviewing the CSAS policy on timelines, ensure that timelines remain as short as or shorter than current realized rates and that Science Advisory Reports and Science Response reports are intended to be published prior to discussions surrounding decision making with rights-holders and stakeholders
- Continue to hold external technical briefings of final science advice after high-profile meetings (e.g., Northern cod stock assessment) with management, rights-holders and stakeholders as well as additional briefings with media
- Publish finalized summary bullets and the list of meeting attendees and affiliations on the CSAS website prior to technical briefings or discussions surrounding decisions with rights-holders and stakeholders to allow attendees time to process the information and prepare questions
- Notify via email all CSAS meeting participants and members of relevant advisory boards when final versions of documents are available
- Provide a public listserv to which interested parties could sign up to receive monthly email updates of new publications

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Tables:

Table 1. The average number of days late that documents were published, with respect to when CSAS policy timelines indicated documents should have become available, for all documents of each type resulting from Canadian Science Advisory Secretariat (CSAS) meetings held in 2017 and 2018. See Figure 4 for an indication of the percentage and number of expected documents of each type published on time or still not published from these meetings.

Document type	Number of days after CSAS policy timelines indicated documents should have become available			
	Mean	Minimum	Maximum	Median
Proceedings	162	9	473	117
Research Document	255	2	690	249
Science Advisory Report	144	7	669	92
Science Response Report	100	1	455	71
All types	163	1	690	113

Table 2. The average number of days after meeting end date until document publication for all document types published (late and on time) resulting from Canadian Science Advisory Secretariat (CSAS) meetings held in 2017 and 2018. See Figure 4 for an indication of the percentage and number of expected documents of each type still not published from these meetings.

Document type	Number of days after meeting end date until document publication			
	Mean	Minimum	Maximum	Median
Proceedings	256	36	618	245
Research Document	387	77	835	385
Science Advisory Report	197	14	739	155
Science Response Report	128	6	525	105
All types	225	6	835	177