



An ancient Inuit inukshuk serves as a landmark for seafarers in a fjord of Baffin Island, Nunavut, Canada. This inukshuk is estimated to be at least one thousand years old. Source: City Escapes Nature Photo / Shutterstock.com.

Smart as SILK: An innovative advisory body for implementing the knowledge-based requirements of the Central Arctic Ocean Fisheries Agreement

Betsy Baker, Global Fellow, Polar Institute

I. INTRODUCTION

The 2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAOFA) breaks much new ground. As others have noted, the CAOFA embraces an extraordinary approach to precaution in seeking to solve a problem — damage to the marine environment by unregulated commercial fishing — before such a problem has occurred (Morishita 2019, Balton 2018). Equally innovative is the Parties' obligation to take into

account Indigenous knowledge and local knowledge as well as the best available scientific information when making implementation decisions. The Parties' other obligations involving SILK or scientific (SK), Indigenous (IK), and local knowledge (LK) include establishing and implementing a Joint Program of Scientific Research and Monitoring (JPSRM) and holding joint scientific meetings (JSM) (Articles 4.2, 4.6 respectively). Any committees formed in

connection with these or other Article 4 activities shall be open to Arctic Indigenous peoples' representatives (Article 5.2).

The CAOFA offers little guidance on what type of body will assist the Parties in carrying out their knowledge-based obligations. This gives rise to four key challenges: 1) deciding whether to establish an in-house or external advisory body, 2) creating successful mechanisms for including IK and LK with "the best available scientific information" when few models exist, 3) ensuring equitable participation of Parties and other knowledge holders in their respective roles, and 4) drawing appropriately on the work of others that are already generating SILK relevant to the CAO and related ecosystems.

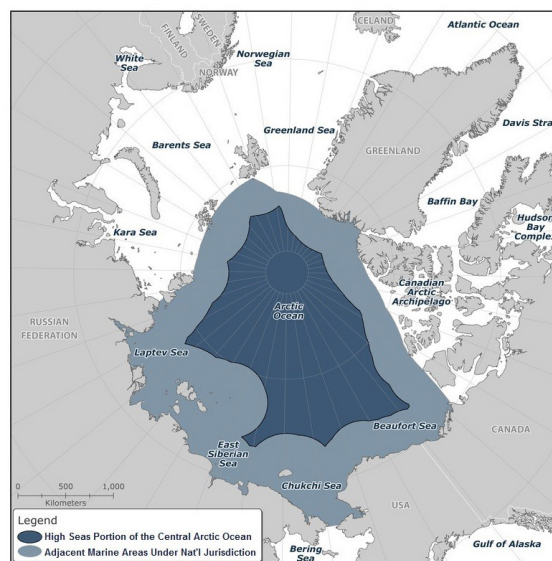
This article proposes a design and working title for such a body — the SILK Committee — which would provide a hybrid of in-house and external advice at the Parties' discretion; furnish the mechanism for Indigenous, local, scientific, and other knowledge holders to co-produce information for the Parties; support equitable and appropriate participation of Parties and knowledge holders pursuant to the CAOFA; and coordinate with outside research projects and institutions to inform the committee and expand the reach of their individual efforts.

This proposal draws on tools used by Regional Fisheries Management Organizations (RFMOs¹), the Commission on Conservation of Antarctic Living Marine Resources (CCAMLR), Arctic Indigenous organizations, and other research institutions as well as on the nascent body of literature addressing how to structure a knowledge body for the CAOFA (e.g., Shin/Harrison 2019, Wheeler et al. 2020, ICES/PICES undated, Van Pelt et al. 2017).

II. THE CAOFA AND TRANSITION TO A STANDING KNOWLEDGE BODY

In October 2018, nine nations and the European

FIG. 1 - Central Arctic Ocean



Map: Kathy Butterfield, Wilson Center

Union signed the CAOFA.² A mere two years later, all but one had ratified it. China's anticipated ratification will trigger the CAOFA's entry into force. The Agreement Area is defined as:

the single high seas portion of the CAO that is surrounded by waters within which Canada, the Kingdom of Denmark in respect of Greenland, the Kingdom of Norway, the Russian Federation, and the United States of America exercise fisheries jurisdiction. (Article 1(a))

The objective of the CAOFA is:

to prevent unregulated fishing in the high seas portion of the CAO through the application of precautionary conservation and management measures as part of a long-term strategy to safeguard healthy marine ecosystems and to ensure the conservation and sustainable use of fish stocks. (Article 2)

The measures and strategy named in the objective are tools for accomplishing the overarching goal

of preventing unregulated fishing. Without these two tools — the “precautionary conservation and management measures” and the “strategy” of ensuring marine ecosystem health and sustainable use of stocks — the overarching objective cannot be reached. In turn, those two tools will only be as good as the SK, IK, and LK that inform them and the structures that channel knowledge to the Parties.

The CAOFA prohibits commercial fishing in the

Agreement Area with only very minimal exceptions (Article 3.1(a)). At some point, the Parties may decide to replace the CAOFA with a different instrument, one that would permit commercial fisheries and create a process for managing such fisheries on a sustainable basis.³ The decision to move to this different regime, however, must be based on SK, IK, and LK. Until that decision is made, scientific research supporting the JPSRM and limited exploratory fishing may take place on terms

FIG. 1 - Acronym Guide

ATS	Antarctic Treaty System
CAO	Central Arctic Ocean
CAOFA	2018 Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (i.e. Central Arctic Ocean Fisheries Agreement)
CCLAMR	Commission for the Conservation of Antarctic Living Marine Resources
EAF	ecosystem approach to fisheries management
FISCAO	Scientific Experts on Fish Stocks in the CAO
IASC	International Arctic Science Committee
IATTC	Inter-American Tropical Tuna Commission
ICC	Inuit Circumpolar Council
ICES	International Council for Exploration of the Sea
IK	Indigenous knowledge
ITK	Inuit Tapiriit Kanatami
JPSRM	Joint Program of Scientific Research and Monitoring (CAOFA, Article 4)
JSM	joint scientific meetings (CAOFA, Article 4.6)
LK	local knowledge
MoP	meetings of the parties
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North-East Atlantic Fisheries Commission
PAG	Pacific Arctic Group
PICES	North Pacific Marine Science Organization
PSCG	Provisional Scientific Coordinating Group (also PKCG: Provisional Knowledge Coordinating Group)
RFMO	Shorthand for Regional Fisheries Management Organizations and Regional Fisheries Management Arrangements
RoP	Rule(s) of Procedure
SC	Scientific Committee
SCAR	Scientific Committee on Antarctic Research
SK	scientific knowledge and information
SILK	scientific knowledge, Indigenous knowledge and local knowledge (distinguishing each as distinct sources of knowledge)
ToR	Terms of Reference
WG	Working Group

agreed by the Parties (Article 3.2, 3.3).

The CAOFA devotes two central articles to the Parties' use of SK, IK, and LK, referring to "indigenous and local knowledge" in Articles 4 and 5. This paper proceeds on the understanding that SK, IK, and LK are distinct knowledge sources (IASC 2020a, Behe and Daniel 2018, ICC-Alaska 2020, Wheeler et al. 2020). When "ILK" is used, as in the acronym SILK, it is to be read as distinguishing between those sources.

Article 4 requires the Parties to establish the JPSRM within two years of entry into force and to hold JSMs at least every two years to provide timely advice to the meetings of the Parties (MoPs). The Parties must ensure the JPSRM "takes into account the work of relevant scientific and technical organizations, bodies, and programs, as well as indigenous and local knowledge" (Article 4.4). Article 4.6 requires the Parties to hold JSMs at least two months before the MoPs and accomplish three things: "present the results of their research" (which must take IK and LK into account under Article 4.4), "review the best available scientific information, and ... provide timely scientific advice to meetings of the Parties."

Article 5 specifies additional requirements for the general MoPs which are distinct from the JSMs and decisions reached there. The Parties shall use these MoPs to review implementation of the CAOFA (Article 5.1(a)) and "all available scientific information developed through the [JPSRM], from the national scientific programs, and from other relevant sources, including indigenous and local knowledge" (Article 5.1(b), Bankes 2019). Based on that information and other ecosystem considerations relevant to the Agreement Area, the Parties shall decide whether to commence negotiations to establish one or more additional regional or sub-regional fisheries management

bodies (Article 5.1(c)). To promote implementation of the CAOFA — including the JPSRM, JSM, and other activities pursuant to Article 4 — the Parties may form committees in which Arctic Indigenous peoples may participate (Article 5.2).

Together, Articles 4 and 5 identify at least seven distinct sources of information the Parties must consider when implementing the CAOFA: 1) the JPSRM, which in turn must "take into account" 2) the work of relevant scientific and technical organizations, bodies, and programs, 3) IK and 4) LK. At the JSMs, the Parties shall review 5) the best available scientific information and 6) the Parties' "own research," the latter of which is presumably generated by 7) "the national scientific programs" referenced in Article 5.1(b). Notably, even as the CAOFA requires expanding the relevant sources of information beyond SK to IK and LK, the names of institutions it creates — JPSRM and JSM and the Provisional Scientific Coordinating group discussed in the next section — still refer only to science. The signatories or MoP might address this situation at the appropriate time.

From a Transitional to a Standing Advisory Body

Building on the longstanding international scientific cooperation that accompanied negotiation of the CAOFA, the signatories established a Provisional Scientific Coordinating Group (PSCG) with Terms of Reference (ToR) in May 2019 (PSCG 2020). The PSCG first met in February 2020 and is widely expected to transition to a permanent body upon the CAOFA's entry into force. Ideally, that body will have a robust mandate and an effective set of procedural rules, which the Parties may model on the PSCG. The PSCG, however, has been fully occupied with carrying out its May 2019 ToRs with little time to focus on transforming its own



An Arctic Cod rests in an ice-covered space. Source: Shawn Harper, Hidden Ocean 2005 Expedition: NOAA Office of Ocean Exploration. Flickr.com.

procedural rules and organizational structure into those appropriate for a standing body.

This paper proposes the SILK Committee as successor to the PSCG. The SILK Committee would perform functions distinct from yet somewhat comparable to RFMO advisory bodies. Therefore, this paper highlights examples and best practices from the scientific committees (SC) of select RFMOs and other living marine resource advisory bodies. The examples and best practices draw on four of the few published sources that discuss how to support the CAOFA's science and knowledge mandates: Shin/Harrison 2019, Wheeler et al. 2020, ICES/PICES undated, and Van Pelt et al. 2017. First, a major factor underlying the successful conclusion of the CAOFA was involving

Arctic and non-Arctic states on equal footing. Shin and Harrison's Asia Dialogues give special voice to the interests of China, Japan, and South Korea in equitable participation in all aspects of the CAOFA (2019).

Second, equity and equitable participation are also key concerns of IK holders in Wheeler et al.'s "Transformative Changes" which, while not specific to the CAOFA, addresses how to use IK with, rather than integrating or diluting it into, science for environmental decision-making in the Arctic (2020).

Third, in "An ICES/PICES Contribution," the International Council for Exploration of the Sea (ICES) and the North Pacific Marine Science Organization (PICES) propose providing scientific

coordination, data, and other services in support of the CAOFA's scientific provisions.

Fourth, "The Missing Middle" by Van Pelt et al. documents multiple entities engaged in marine science in or near the Central Arctic Ocean (CAO) with varied geographic scope and little or no central coordinating body for CAO science generally, including fisheries science (2017). Together, these four analyses represent the groundbreaking combination of Parties and knowledge sources that make the CAOFA unique among intergovernmental agreements.

III. THE SILK COMMITTEE AS A STANDING HYBRID BODY WITH DUAL FUNCTIONS: LESSONS FROM SELECT RFMOS AND OTHER LIVING MARINE RESOURCE ADVISORY BODIES

The SILK Committee is proposed as an independent standing body established pursuant to the CAOFA, to serve as the primary source of advice to the MoPs. The Committee would not conduct original research but instead be a hybrid channel to the MoPs for two general categories of advice:

1. In-house advice prepared by the SILK Committee and presented at the JSMs mandated by Article 4.6. This advice would be based on the Committee's assessment and synthesis of the best available SK, IK, LK and information using the sources required by the CAOFA. The SILK Committee would be responsible for organizing the JPSRM and the JSMs, possibly with logistics support from external groups as appropriate.
2. External advice obtained only upon request of the MoPs and channeled through the SILK

Committee from "relevant scientific and technical organizations, bodies and programs" (Article 4.4). These sources could include independent entities such as ICES, PICES, the Pacific Arctic Group (PAG), relevant Indigenous organizations, and other institutions or individuals already engaged in studying relevant aspects of the CAO and adjoining ecosystems.

This hybrid structure would allow the SILK Committee to a) continue responding to elements of the PSCG ToR that remain relevant after the CAOFA enters into force, and b) to address the four challenges identified at the outset of this paper.⁴ For example, it accommodates different approaches to whether the science body should be internal or external. The SILK Committee would be hybrid in a second sense, of coordinating information received from outside partners to inform the Parties while ensuring that critical information generated by the CAOFA's JPSRM and JSMs would be communicated to those partners and other relevant bodies.

A Chatham House study recommending best practices for RFMOs identifies two basic approaches to providing scientific advice to decision-making bodies: in-house and independent (Lodge 2007). A recent dissertation expands the internal/external dichotomy to a broader range of approaches for scientific support to RFMOs, including "loosely coordinated scientific data and advice," "[s]tates pool[ing] resources to have scientists work under direction of central secretariat or committee," and a "complete outsourcing" of scientific advice to independent organizations (Midson 2007, 414). A new study by the Food and Agricultural Organization (FAO) looks more broadly at governance structures and activities of RFMOs without focusing on how science bodies function (Løbach et al. 2020, 3).

None of these three studies examines the role

of IK or LK in providing advice in part because the agreements surveyed do not require it, providing another reminder of the groundbreaking character of the CAOFA. Examples of IK supporting management and co-management decisions exist primarily on the national level and could be fruitful models for the SILK Committee as discussed, e.g., in the series of workshops on Inuit engagement in the CAOFA led by the Inuit Circumpolar Council (ICC).⁵

The Chatham House study identifies only one organization that combines in-house and independent scientific advice. The SC of the Western and Central Pacific Fisheries Commission is “composed of national representatives, but also employs independent scientific experts — answerable to the SC — to provide the basic impartial scientific data and advice that are considered by the scientific committee” (Lodge

2007, 33). The proposed SILK Committee adopts this hybrid approach while drawing upon select aspects of how two other advisory bodies obtain science advice for their decision-making bodies: the CCAMLR and the Northwest Atlantic Fisheries Organization (NAFO).⁶

A. SILK COMMITTEE: KEY ELEMENTS

The following proposals for the SILK Committee’s mandates, representation, funding and independence vis-à-vis the MoPs set the stage for discussing how the committee can adapt similar elements from the CCAMLR and NAFO SCs without adopting either model wholesale.

SILK Committee Mandates

The “Proposal of Rules of Procedures for future PSCG meetings or succeeding body” (PSCG 2020)



Participants at the 4th Meeting of Scientific Experts on Fish Stocks in the CAO, September 26–28, 2016, Tromsø, Norway. Sources: NOAA / <https://www.fisheries.noaa.gov>.

agreed upon at the first meeting of the PSCG in Ispra, Italy — the Ispra Draft Rules of Procedure (RoPs) — is a logical starting point for formulating SILK Committee mandates and, indeed, its representation even though the CAOFA signatories have yet to approve those RoPs. Two changes to consider before approving the rules would be to distinguish more clearly between IK and LK (ICC 2020), and to replace the S (“Science”) in PSCG with K (“Knowledge”), changing the name to PKCG to reflect the CAOFA’s innovation in requiring Parties to consider more than science in its decision-making.

As for mandates, under Draft RoP 2, the signatories will set ToRs “taking into account: i. Articles 4 and 5 of the [CAOFA], ii. PSCG’s functions, iii. Previous PSCG proposals, and iv. Signatories’ requests” (PSCG 2020). From these draft RoPs, three broad mandates emerge for the SILK Committee, as the proposed successor body to the PSCG:

- i. Set CAOFA knowledge priorities
- ii. Facilitate and coordinate research
- iii. Provide information and advice to Parties

Building on the second mandate, for example, the SILK Committee should establish a standing committee on research coordination (STACREC) at the outset, based on NAFO’s SC subcommittee of the same name. This step would highlight and act upon the critical importance of using SK, IK, and LK projects to increase understanding of CAO fish stocks and ecosystems. Tasks for the SILK STACREC should include leading planning and implementation of the JPSRM. Launching the JPSRM as soon as possible necessarily relies on knowledge holders from multiple disciplines, states and geographic areas relevant to the CAOFA. Here, the SILK Committee could learn from the NAFO

STACREC’s experience whose RoPs require it to:

- iii) coordinate the planning and execution of international cooperative research in cooperation with coastal States in the Convention Area; iv) encourage and promote cooperation among the Contracting Parties in scientific research designed to fill gaps in knowledge pertaining to fisheries matters identified by the Scientific Council.” (NAFO STACREC RoP 5.1.b.)

The CAOFA’s explicit reference to the work of other relevant bodies in Article 4.4 provides further support for the SILK Committee to expand its coordination beyond researchers directly affiliated with the Parties. The CAOFA’s references to IK and LK in Articles 4 and 5 lend support for coordination and facilitation of IK, LK, and SK research.

Part IV elaborates further on all three proposed SILK Committee mandates.

SILK Committee Representation

The Ispra Draft RoPs proposed for future meetings of the PSCG or its successor provide that membership would “consist of delegations appointed by each Signatory, including scientists and holders of indigenous and local knowledge as the respective Signatory deems appropriate” (PSCG 2020, RoP 1). The ICC sponsored series of workshops on “Inuit Engagement in the [CAOFA]” is expected to culminate in a mid-2021 report with more detail on mechanisms for including IK and LK holders in the work of the PSCG successor body.⁷

As with the proposed Ispra Draft RoP for membership, all Parties would be members of the SILK Committee, but this alone will not ensure their equitable participation. Even CCAMLR, the “leader to follow” for fisheries management (Willock and

Lack 2006; Miller 2011), continues to invest in mechanisms that aim to expand opportunities for all states to drive the work of the SC.⁸ CCAMLR's "General Science Capacity Special Fund," established in 2009 to "promote burden sharing and promote wider participation," (CCAMLR 2009, para. 16.9), is a possible model for the SILK Committee, as are CCAMLR scholarships, both discussed below under SC-CCAMLR funding.

The consensus decision-making recommended by the Ipsra Draft RoPs will help contribute to more equitable participation in the SILK Committee but not guarantee it. An approach widely followed in contemporary RFMO SCs (Løbach et al. 2020, Lodge 2007), consensus is recommended for the CAOFA (Shin/Harrison 2019). The SILK Committee could, however, implement the added safeguard of requiring at least two CAO coastal and two

non-coastal representatives, including significant Indigenous representation, to lead any working groups or major initiatives such as organizing the JPSRM and the bi-annual JSMs. The SILK Committee should also address barriers to equitable participation by all knowledge holders that exist even with consensus decision making (ICC-Alaska 2020, 50, 140). Factors to consider include language, funding, succession planning, and other challenges as well as mechanisms to overcome them such as trust-building and co-production of knowledge (Wheeler et al. 2020, Meredith et al./ IPCC 2019).

SILK Committee Independence vis-à-vis the Meeting of the Parties

A 2017 survey of multiple RFMO SCs concludes that independent scientific advice is "a key input to



Part of the U.S. delegation to the Inuit Circumpolar Council assembly in Utqjagvik listens to proceedings. Source: Yereth Rosen.

quality” of RFMO decision-making:

The Scientific Committee should not just be coordinators of State views; they should have a life of their own, they should conduct their own work and analysis separate from the State, even if the work is done by State scientists. (Midson 2017)

Complete SC independence may hinder salience and responsiveness of the scientific advice in some instances (Midson 2017). CCAMLR and NAFO each combine national representation in the SC with scientific independence, following a practice prevalent in many advisory bodies that “appears more effective than complete independence,” i.e., obtaining advice from an external body (Midson 2017).

National delegation scientists and IK and LK holders working together in the SILK Committee could operate independently of political aspects of the Parties’ decision-making process without completely separating the two. The recent modernization of NAFO to streamline governance and incorporate an “ecosystem approach to fisheries management” (EAF) in the NAFO Convention preamble offers a timely lesson:

Keeping the science advice at arm's length of the management process is important, but bringing scientists and managers together is the most effective way of implementing an EAF framework. (Koen-Alonso et al. 2019)

NAFO uses a dedicated SC working group (WG) to generate ecosystem advice for the Parties and 2) a joint WG of commission and SC members. The joint WG provides a forum for managers and scientists to better understand each other’s inputs and needs before advice is finalized or implemented. This complementary WG model may

prove most useful to the SILK Committee when the Parties are closer to determining whether to commence negotiations on one or more regional or sub-regional fishery management organizations (CAOFA, Article 5.1.c.i). Establishing a joint WG for decision-makers and SILK Committee members upon entry into force, however, could benefit earlier ecosystem-relevant decisions, including the design of the JSMs and any ecosystem approach framework to be developed by the committee and serving as a forum for scientists, IK holders,

LK holders and managers to better understand their respective inputs. It would also help build trust between the Parties and the SILK Committee similar to NAFO’s experience detailed in III.c. below. The joint WG would complement the work



Ambassador David Balton's presentation to the Arctic Circle Assembly, Reykjavik, Iceland, October 15, 2017. Source: David Benton.

of the SILK Committee, which would remain a forum for the specialized expert knowledge holders (SK, IK, and LK) to generate ecosystem advice.

Two other RFMOs with strongly independent scientific advice mechanisms, while not proposed as models for the CAOFA, demonstrate why the SILK Committee should primarily rely — at least initially — on in-house collaboration among national scientific delegations to support the CAOFA's knowledge-based obligations. The Inter-American Tropical Tuna Commission (IATTC) relies on scientific advice generated by scientists who work for IATTC Secretariat, essentially serving as international civil servants (Lodge 2007). The expense of supporting a large scientific staff, and the uncertainty as to whether the CAOFA Parties will even establish a secretariat, precludes its usefulness as a model for the SILK Committee, but the remarkably independent scientific advice generated through the IATTC structure is noteworthy (Oh 2011).

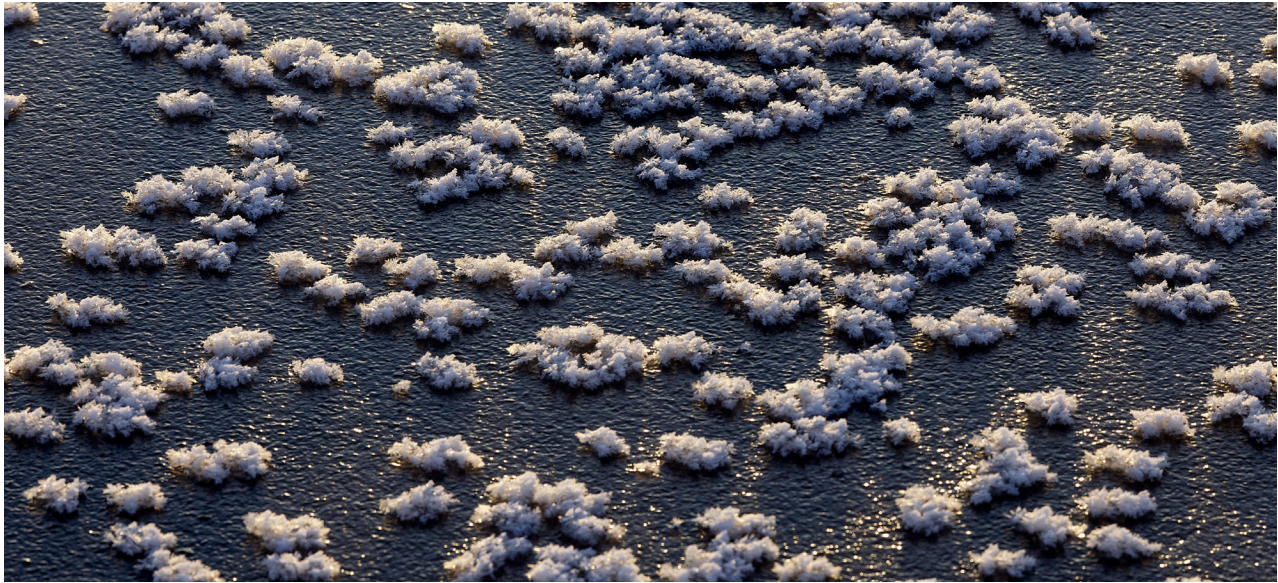
At the other extreme, the North-East Atlantic Fisheries Commission (NEAFC) outsources its science advisory work to ICES, an independent intergovernmental organization that responds to requests from NEAFC whose jurisdiction overlaps with part of the Agreement Area (CAOFA Preamble, para. 7; Molenaar 2020). While ICES or any other independent organization should not be the primary source of knowledge or advice to the CAOFA Parties, it could contribute to their work by providing occasional studies upon request, offering ecosystem assessment reports as a model for future SILK Committee projects, or assisting with data support or science meeting logistics. Such partnerships could foster efficiencies and leverage limited resources for Arctic marine science.

SILK Committee Funding

The CAOFA does not address the Parties' financial

obligations. Presumably, the SILK Committee can be assured of national support for each Party's SC delegation, national scientific programs, and implementation of the JPSRM and JSMs. The Signatories should nonetheless continue to lay the groundwork now for the Committee's additional support, building on their collective work to date on the JPSRM, and their recognition of both the costs of doing research and survey work in the Arctic and the benefits of collaborating in those efforts (NOAA 2015, FisCAO 2018, PSCG 2020). They could, for example, have their respective national science funding bodies encourage independent researchers to pursue themes relevant to implementing the CAOFA, an initiative that could continue after entry into force. Capacity building funds, voluntary or otherwise, could also help address the Parties' and knowledge holders' equitable participation in the SILK Committee. Several such CCAMLR funding models are discussed in III.b. below.

The Chatham House report on best RFMO practices ties the funding of strong scientific advice to its independence, noting that how to achieve the required "level of [scientific] impartiality has been the subject of much debate in RFMOs" (Lodge 2007, 32-23). The report suggests one path to achieving impartiality is the Western and Central Pacific Fisheries Commission's combined in-house and external advice introduced above and recommended for the SILK Committee. Because the committee is not (yet) associated with any RFMO, its science and knowledge needs could be viewed more broadly and justify soliciting – and paying for – targeted advice from IASC, ICC, ICES, PAG, PICES, or other relevant bodies. The JPSRM's mandate to "take into account the work of relevant scientific and technical organizations, bodies, and programs as well as indigenous and local knowledge" (Article 4.4) further supports this direction.



"Ice flowers" in the Central Arctic Ocean. Source: Michael Gutsche, MOSAiC Multimedia Centre. <https://multimedia.awi.de/mosaic/>.

B. THE CCAMLR SCIENTIFIC COMMITTEE (SC-CCAMLR): KEY ELEMENTS

Multiple analyses conclude that CCAMLR exemplifies best practices for many aspects of fisheries management, including quality of scientific program and advice (Lodge 2007, Miller 2011, Willock and Lack 2006). The Asia Dialogues point to CCAMLR research, as well as the work of the PAG as strong examples of SCs relevant to the CAOFA (Shin/Harrison 2019). Eight of the ten CAOFA signatories are members of CCAMLR, with Denmark and Iceland as exceptions.

SC-CCAMLR Mandate

The title and objective of the Convention establishing CCAMLR are identical: "the conservation of Antarctic marine living resources" (Article II.1). The Commission gives effect to the Convention's objective and principles by

"facilitat[ing] research into and comprehensive studies of Antarctic marine living resources and of the Antarctic marine ecosystem" (Article IX.1), and performing a range of related functions. In doing so, "the Commission shall take full account of the recommendations and advice of the Scientific Committee" (Article IX.4). The SC, in turn, "shall provide a forum for consultation and co-operation concerning the collection, study and exchange of information with respect to the marine living resources to which this Convention applies" and "encourage and promote co-operation in the field of scientific research in order to extend knowledge of the marine living resources of the Antarctic marine ecosystem" (Article XV).

In contrast with the CAOFA, CCAMLR is a well-established organization. Many of its lessons will be more relevant to any future CAO regional or sub-regional organizations negotiated pursuant to Article 5 of the CAOFA. To reiterate, the CAOFA does not establish an RFMO but instead lays out science- and knowledge-based pathways for the Parties to decide

whether to commence negotiations to establish one or more management organizations. Still, precisely because how to manage fisheries in an ecosystem/multispecies context is “an ongoing and difficult issue, as well as one that particularly vexes CCAMLR,” the ecosystem work of the CCAMLR SC can inform how the SILK Committee structures the JPSRM and JSMs for greater understanding of CAO fish stocks and ecosystems (Miller 2011, 106, Constable et al. 2000).

SC-CCAMLR Representation

Each Contracting Party to the Convention on the Conservation of Antarctic Marine Living Resources is a Member of the CCAMLR. Parties subsequently acceding to the Convention are entitled to Commission membership when actively engaged in research or harvesting of resources covered by the Convention. Each Commission Member is in turn a Member of the SC, to which it “shall appoint a representative with suitable scientific qualifications, who may be accompanied by other experts and advisers” (SC RoP 1, emphasis added). Universal representation of the Commissioners on the SC is designed to ensure the opportunity for equitable participation in the work of the SC scientific recommendations.⁹ This model is adopted only to a certain extent in the Ispra Draft RoP 1 which, as seen above in III.a., provides: “The PSCG is to consist of delegations appointed by each Signatory, including scientists and holders of indigenous and local knowledge as the respective Signatory deems appropriate.” The SILK Committee RoPs could state expressly that the representatives should have “suitable qualifications” in SK, IK, or LK.

SC-CCAMLR Funding

CCAMLR science depends upon Members’ and

Observers’ voluntary research (Constable et al. 2000, 789; Jones 2018). Although the SC receives its funding as part of CCAMLR’s operating budget, it has been suggested that parties to all Antarctic Treaty system (ATS) agreements, which include the Convention establishing CCAMLR, “could usefully work towards developing mechanisms to promote financial support for research to address policy priorities,” including climate change effects (Hughes et al. 2018).¹⁰ ATS national delegations could communicate home the need to fund domestic research targeting specific Antarctic policy relevant issues as could CAOFA Parties for CAO-centric research needs.

CCAMLR has established several capacity-building funds relevant to CCAMLR science. The “General Science Capacity Special Fund” established in 2009 supports burden sharing, builds capacity, and encourages broader participation from all Members, including young scientists, in the SC’s work (CCAMLR 2009, paras. 16.8-16.9). The voluntary “Supplemental Research Capacity Fund” was launched in 2012 to support committee internships and training opportunities for early career IK holders and scientists (UN Regular Process). In 2019, CCAMLR established the separate “General Capacity Building Fund,” which promotes collaborative research and assists with collection, analyses, and exchange of data regarding marine living resources covered by the Convention (CCAMLR 2019, paras. 10.9 ff).

SC-CCAMLR Independence vis-à-vis the Commission

The SC-CCAMLR is designed to operate independently of the Commission Members represented on it and conducts its own research (unlike the proposed SILK Committee), while also

coordinating research and carrying out other tasks specified in the Convention's Article IX (Scully 2011). The combination of full representation through qualified scientists, the independent structure and tasks specified in the Convention, and SC-CCAMLR's established record of responsive advice to the Commission largely free of influence from non-scientists offers a useful model for the SILK Committee. The model leaves room for the SILK Committee to conduct its own research should the Parties deem that appropriate and to add any safeguards deemed necessary to ensure that the expertise of SK, IK, and LK holders drives Committee deliberations.

The SILK Committee would be designed to operate on its own within the CAOFA structure, but it could usefully study the independent Scientific Committee on Antarctic Research (SCAR). SCAR predates the Antarctic Treaty and enjoys a well-established reputation for "reliable, independent and objective scientific advice to the ATS" (Hughes et al. 2018, 91). SCAR's recognized strength in integrating the work of scientists from multiple countries and disciplines across the vast areas covered by the ATS to "address science and policy questions that are challenging for a single country to deliver" should be of particular interest to the SILK Committee, which faces similar challenges in the CAO (Hughes et al. 2018, 91).

SCAR has Observer status but does not currently provide scientific advice directly to CCAMLR. It does make occasional submissions to SC-CCAMLR even though SCAR and other independent experts were excluded from CCAMLR's scientific WGs as recently as 2018 (Hughes et al. 2018, Brooks et al. 2018). Discussions to identify opportunities for CCAMLR to access SCAR's policy-ready research outcomes are ongoing (Hughes et al. 2018). The SILK Committee should track these and other aspects of how collaboration between SCAR and ATS bodies can help identify shared science needs

SIDEBAR: ADAPTING NAFO'S MODULAR APPROACH FOR THE SILK COMMITTEE

- Unlike the NAFO Convention, the CAOFA expressly requires decision-makers to take IK and LK into account pursuant to Articles 4 and 5. Still, NAFO's modular approach to EAF may offer guidance for designing the mechanisms and processes the PSCG was tasked with for including IK and LK in its work (PSCG 2020, ToR 2). Rather than using a modular approach including socio-economic-cultural factors in EAF, a SILK-specific modular approach could include IK-relevant information more systematically and at the outset.
- For example, recent PSCG responses to two tasks in the 2020 Ispra Report reference IK only anecdotally: ToRs 3) updating the planned scientific activities and inventories of mapping activities, and 4) prioritizing mapping activities, including updates to knowledge gaps.
- With a pro-active modular approach, the SILK Committee could include a column in each ToR reporting table to indicate whether IK or LK is relevant to the activity listed and, if so, what data gaps exist. The PSCG 2020 report identifies knowledge gaps in Table 3 for key questions, yet reference to IK is difficult to locate in the table. Including an IK column would require compilers and readers to consider whether, in fact, relevant IK sources might be being overlooked and why. The CAOFA explicitly states that the Parties "shall take into account relevant fisheries management and ecosystem considerations" in determining whether the Agreement Area "would support a sustainable commercial fishery" (Article 5.1.c). For true co-production, IK contributions to understanding the relevant CAO and shelf ecosystems should be included from the outset in order to develop actionable ecosystem objectives.

(Hughes et al. 2018, Constable 2000). To be clear, the CAOFA anticipates neither an Arctic-wide marine science body nor an ATS-like "Arctic Treaty system." Yet, if such a pan-Arctic marine science organization is established in the future, the SILK Committee's clear understanding of the relevant interactions between SCAR and the ATS would position the CAOFA to take a leading role in its design.

C. THE NAFO SCIENTIFIC COUNCIL: KEY ELEMENTS

Established in 1949, NAFO has thirteen Contracting Parties, which includes all CAOFA signatories

save China. The 2007 amendments to the NAFO Convention entered into force in 2017 and are of particular interest for two major modernizations relevant to the SILK Committee: incorporating an EAF and streamlining governance. The convention's newly restated objective is "to ensure the long term conservation and sustainable use of the fishery resources in the Convention Area and, in so doing, to safeguard the marine ecosystems in which these resources are found" (Article II).

NAFO SC Mandate

The mandates of the NAFO Commission and Scientific Council are interwoven yet independent. The Commission shall guide the SC in identifying



Scientists on ice in the CAO. Source: Michael Gutsche, MOSAiC Multimedia Centre. <https://multimedia.awi.de/mosaic/>.

tasks and priorities for its work (Article VI.5.i) and shall, “in collaboration with the Scientific Council” (emphasis added):

- Review fish stocks status, identify conservation and management actions,
- “[C]ollect, analyze and disseminate relevant information,”
- Assess the status of fish stocks and identify actions for their conservation and management,
- Assess impacts of fishing activity, and
- Develop guidelines for scientific fishing and data management (Article VI.6).

In language similar to SC-CCAMLR's duties, the NAFO SC shall:

(a) provide a forum for consultation and cooperation among the Contracting Parties to study and exchange SK and views on fishing activities and the ecosystems in which they occur, and to study and appraise the current and future status of fishery resources including environmental and ecological factors affecting them;

(b) promote cooperation in scientific research among Contracting Parties to fill gaps in scientific knowledge. (Article VII.8)

The collaboration between the NAFO Commission and SC, and the separation between science and decision making, is further reflected in the fact that the Commission may refer to the SC “any question pertaining to the scientific basis for the decisions it may need to take” (Article VI.7), while the SC shall provide scientific advice to the Commission as required by the Commission (Article VII.8.e). The interplay between the Commission, SC, and the secretariat results in “the [predominant] use of scientific advice from Member States,” and

represents a variation on the pooling of state resources (Midson 2017).

NAFO SC Independence vis-à-vis the Commission

NAFO’s recently streamlined structure helps build trust among managers, scientists, stakeholders, and others. Trust is needed to “lend credibility to the ecosystem-based advice, and to develop and/or modify the existing formal pathways to better incorporate different types of information into the decision-making process” (Koen-Alonso et al. 2019, 344; Soomai 2017). For example, the joint Commission/SC EAF WG mentioned in III.a. above complements the SC-only WG on EAF to provide both groups with much needed information, namely:

feedback to SC on management implications, ways of implementation, and potential concerns associated with EAF deployment, and input to [Commission] on how to consider the ecosystem advice provided within their decision-making process. (Koen-Alonso et al. 2019, 348-349)

These formal pathways channel ecosystem advice into NAFO’s advisory and decision-making process and build trust by providing a “scientist-managers dialogue on Roadmap development and implementation,” (Koen-Alonso et al. 2019), offering a positive model for the SILK Committee to include scientists, managers, IK and other knowledge holders.

Trust building in NAFO is still a work in progress around how to include social and cultural information in the EAF. Among the lessons learned from developing the EAF are that “4. Natural sciences are foundational for EAF, but are not enough” (Koen-Alonso et al. 2019). The NAFO Convention preamble recognizes “the economic



"Pancake ice" in the CAO. Source: Michael Gutsche, MOSAiC Multimedia Centre. <https://multimedia.awi.de/mosaic/>.

and social benefits deriving from the sustainable use of fishery resources" and the EAF Roadmap acknowledges the importance of socio-economic factors. The SC, however, has been slow to develop mechanisms to adequately include socio-economic-cultural information in its work (Koen-Alonso et al. 2019). The EAF Roadmap's modular approach (see sidebar) allows information not yet included in ecosystem assessments to be used as it becomes available (Koen-Alonso et al. 2019) and offers a channel for introducing socio-economic-cultural components gradually.

NAFO SC Representation

The NAFO Convention provides that "[e]ach Contracting Party shall be a member of the Scientific Council and may appoint representatives who may be accompanied at any of its meetings by alternates, experts and advisers" (Article VII.1). The corresponding SC RoP is a model for the SILK Committee, providing that the SC chairperson "may invite one or more 'guest experts' to meetings of Scientific Council and its subsidiary bodies. The guest expert(s) would not represent a Party or Organization and would have no status at the

meeting other than to provide specific advice and guidance to Scientific Council on particular issues” (RoP 1.2A). The Ispra Draft RoP for the PSCG successor does not specify this level of detail on external experts, but the SILK Committee should consider doing so.¹¹

NAFO SC Funding

NAFO relies on the joint efforts of its members to carry out data sampling programs and provide scientific advice through the SC. Under the NAFO Convention, “[e]ach Contracting Party shall pay the expenses of its own delegation to any meetings held pursuant to this Convention” (Article XI, 1). Some expenses are spread equally but most contributions are tied to each Party’s proportion of nominal catch (a formula that would not be appropriate for the CAOFA, as there is no catch involved). NAFO has established a Scientific Research Fund to supplement amounts budgeted for support of the SC, including support for research on Vulnerable Marine Ecosystems in the NAFO Regulatory Area (NAFO 2019).

IV. SILK COMMITTEE PURPOSE, MANDATES, AND PRINCIPLES

Analysis of the preceding RFMO models in light of the PSCG Terms of Reference, the Ispra Draft RoPs, and common elements from the nascent literature on the CAOFA suggests the following guidance for the SILK Committee.

A. SILK COMMITTEE PURPOSE: KNOWLEDGE-BASED SUPPORT

The Asia Dialogues identify a single purpose for a CAO marine science body: to “[p]rovide scientific support for the CAO Agreement.” For the SILK

Committee, this could be rephrased as to “[p]rovide scientific and other knowledge-based support for the CAO Agreement,” given that Articles 4 and 5 include SK, IK, and LK as sources to be considered in decision-making. The proposed working title of “SILK Committee” intentionally distinguishes between the three as distinct forms of knowledge. The Parties could use the ToRs for the new body to acknowledge the distinct character of SK, IK, and LK without defining them, drawing on other relevant groups’ approaches. The ICC-sponsored workshops process on Inuit Engagement in the CAOFA is expected to propose more specifics on mechanisms for including IK and LK holders in the work of the PSCG successor body.¹²

B. SILK COMMITTEE MANDATES: PRIORITIZE, FACILITATE, ADVISE

Responding quickly to its May 2019 ToRs, the PSCG recommended i) its own interim Rules of Procedure for approval by the Parties (ToR 1) and ii) establishing a WG on Inuit Engagement in the CAOFA that, if approved by the Signatories, could recommend mechanisms for including IK in the PSCG’s work (ToR 2). ToRs 3, 4, and 5 require ongoing information gathering and coordination in related areas: inventorying existing scientific activities and monitoring programs in the CAO high seas and adjacent waters and prioritizing and coordinating scientific mapping work among signatories for the JPSRM based on gaps identified by the Fifth FisCAO report and subsequent updates.¹³ Three mandates emerge for the SILK Committee.

Mandate 1: Set CAOFA Knowledge Priorities

Setting knowledge priorities in a CAOFA Science Plan or Work Plan should be a significant first

task of the SILK Committee. Early efforts of the PSCG in prioritizing and coordinating scientific mapping work among the signatories helped lay the foundation for future JPSRM efforts, which could also include relevant Indigenous mapping contributions in adjacent waters (FisCAO 2018, Appendix C; Raymond-Yakoubian et al. 2020). The plan could draw on entities already engaged in scientific and other research relevant to the CAO and adjacent ecosystems, also furthering Mandate 2, research coordination. The PSCG and preceding FisCAO meetings have identified many such research entities, as have the 2020 ICES/PICES/

PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean Report (ICES/PICES 2020), and the 2020 European Commission Gap Analysis. Candidates to contribute to or lead drafting of the Science/Work Plan include the national science programs and IK bodies of each Party and/or the WGICA. The ten signatories participate in either ICES, PICES, PAME, or all three. A combined effort could involve each Party to the CAOFA contributing resources for writing and implementing the Science/Work Plan and approving it through their national delegation to the CAOFA.



ICC General Assembly, Utqiagvik, Alaska, 2018. Source: Yereth Rosen.

Mandate 2: Facilitate and Coordinate Research

This mandate builds upon the CAOFA's call for cooperation and coordination between the Parties "and relevant international bodies and programs" (Preamble, para. 7) and for the JPSRM to take into account the work of relevant scientific and technical entities, IK and LK (Article 5.4). Examples of research facilitation and coordination opportunities range from connecting existing research networks to increasing the capacity of Indigenous organizations to do their own research (Shin/Harrison 2019, Wheeler et al. 2020, Van Pelt et al. 2017). Facilitating cooperation between multiple regional actors for integrated monitoring and assessment, data collection, and reporting by drawing on mechanisms other actors have created is another possible avenue for the SILK Committee to establish itself as the leader of current and future CAO research coordination (see Lee et al. 2019).

Where other entities are experienced in logistics, data, or meeting support, the SILK Committee could consider a memorandum of understanding for such services, including coordination of the JPSRM, ensuring that the Parties retain exclusive control of design and content. Agreements for external support of functions such as a minimal secretariat could also be considered.

Mandate 3: Provide Information and Advice to Parties

The CAOFA requires the Parties to hold JSMS to, inter alia, "provide timely scientific advice to the meetings of the Parties." Article 4.6. The RFMO models above expand on how the SILK Committee could carry out this obligation by maintaining appropriate independence from the CAOFA decision-making process while ensuring clear, timely communication with the MoP. The SILK

Committee would be the MoP's primary source of advice, but the Parties would be able to engage outside experts to provide additional advice such as research, reports, and other appropriate products – beyond the individual meeting and WG attendance anticipated in the Ispra Draft RoP 3.d.vi. Here, too, a memorandum of understanding with an external entity for such services could be appropriate.

C. SILK COMMITTEE PRINCIPLES: EQUALITY/EQUITY, PARTNERSHIP, AND KNOWLEDGE AMPLIFICATION

Three principles emerge from the literature and RFMO practice as most important for the SILK Committee: Equality/Equity, Partnership, and Knowledge Amplification. Other potential candidates for guiding principles, such as transparency and self-assessment, could be included in a concise list of best practices adopted by the SILK Committee or elevated to principles as well. The importance of transparency, for example, is reiterated in external assessments and internal reports of CCAMLR and NAFO (CCAMLR-SC 2019, Koen-Alonso et al. 2019, Midson 2017, NAFO 2018). Perhaps by oversight, the Ispra Draft RoPs for the PSCG successor reference transparency only in a footnote (PSCG 2020, 50). Numerous sources beyond those discussed above offer guidance on relevant principles (e.g., Clark 2015, DFO 2018, ICC-Alaska 2020, O'Brien and Gowan 2012).

Principle 1: Equality/Equity

Trust and respect are inherent in this joint principle of equal participation of Parties and equitable participation of knowledge holders in the SILK Committee and must be practiced by Parties and other knowledge holders alike. Strong rules of procedure can ensure implementation of this

principle.

Ensuring equity in SILK Committee participation by knowledge holders will help the CAOFA set a new standard for the use of IK beyond simply mentioning it as a source for Parties to consider in decision-making. The principle of equity could be reflected in steps such as supporting research capacity building for scientists to understand IK and work with IK holders, and for IK institutions to direct and guide research through partnerships and on their own (ITK 2018). Other steps include supporting co-production of research questions, requiring validation of IK by IK holders, using IK and SK as mutually reinforcing sounding boards, and speaking not of "integrating" IK into SK but of using them together as distinct sources (Behe and Daniel 2018, Wheeler et al. 2020). Others have suggested "reframing integration as a process in which the originality and core identity of each individual knowledge system remains valuable in itself, and is not diluted through its combination with other types of knowledge" (Bohensky and Maru 2011).

Principle 2: Partnership

The existence of multiple actors involved in researching and understanding the CAO and adjacent ecosystems poses a major challenge for the SILK Committee: building a robust structure for knowledge partnerships that makes the most of their expertise, while avoiding duplication and leveraging existing efforts (PSCG 2020, 13). Success in structuring research partnerships on this scale has the potential to position the CAOFA Parties as leaders in future efforts to coordinate Arctic marine science generally. It could also help implement the international law duty to cooperate in science and technology (e.g., UN Convention on the Law of the Sea, Articles 242 and 243), by operationalizing specific details of an institutional mechanism

for regional or international marine science cooperation (Harden-Davies 2018). For the CAOFA, those details could include incentives for external knowledge partners to participate (e.g., appropriate data sharing) or criteria for identifying "relevant" partners, including an avenue for actors that do not meet those criteria to demonstrate their relevance and thus counter Parties' conscious or unconscious myopia.

Principle 3: Knowledge Amplification

Tied closely to the principle of partnership, SILK Committee tasks emerging from the PSCG ToRs 3, 4, and 5 (updating list of relevant CAO activities, prioritizing mapping based on known gaps, and updating list of mapping opportunities), can all help leverage and amplify the work of other knowledge bodies. For example, the SILK Committee could:

- Systematize how lists of scientific activities, platforms, and monitoring programs are updated (e.g., PSCG ToRs 3 and 5), thereby providing a service to all entities contributing to the lists. This may simply entail documenting how the list was compiled, what criteria were used (e.g., region, scientific discipline, and the like).
- Coordinate not only with partner organizations as in Principle 2 but consider using the UN Decade of Ocean Science for Sustainable Development and other international initiatives to guide how knowledge is leveraged and amplified.
- Propose a work plan for engaging external "relevant scientific and technical organizations, bodies and programs as well as indigenous and local knowledge" (CAOFA Article 4.4) and other bodies to help fill mapping gaps identified by the PSCG. The plan could systematize the ongoing updates to identifying gaps — both filled and emerging future gaps — by designing a uniform

reporting mechanism for contributions from the network of Arctic marine science and knowledge bodies.

The SILK Committee's initial focus would be to advise the Parties on implementing the CAOFA by interfacing with the marine science and IK communities. This focus could be the basis for highlighting CAO fisheries and ecosystem knowledge in the broader context of Arctic marine science and knowledge, possibly as the fisheries/ ecosystems arm of and a pilot for a SCAR-like Arctic research committee. Depending on whether one or more regional or sub-regional FMOs emerge from the CAOFA's Article 5 processes, the SILK Committee might ultimately operate within a larger "Knowledge Committee for Arctic Ocean Research." That committee could in turn link to groups such as AOOS (Alaska Ocean Observing System), IASC, ICC, ICES, ITK, PAG, PICES, academic institutions, and other bodies.

Leaving open the possibility of a future role for the SILK Committee in coordinating marine science beyond the CAOFA accords with a mandate in many marine resource advisory bodies to perform such other functions as the parties may decide (e.g., NAFO Convention Article VI.5.h). It also comports with the consensus at the first three meetings of the Asia Dialogues on the "need for a stand-alone science organization specifically focused on research in the [CAO] and, as appropriate, adjacent areas under national jurisdiction. This organization should be established by governments, where all parties have equal standing" (Shin/Harrison 2019, 12). Ideas presented before and at the Fourth Asia Dialogue, which took place two months after the CAOFA was signed, included the possibility that the Parties could first create an SC and "later create a new marine science organization to assume the responsibilities of the committee" (Balton 2018; Shin/Harrison 2019, 12, 16-17).

V. CONCLUSION

Working with the models, mandates, and principles proposed for the SILK Committee can position the Parties to the CAOFA to begin fulfilling their knowledge-based obligations upon the CAOFA's entry into force. The Committee's robust mandates to prioritize knowledge, facilitate research, and advise the Parties are drawn from the PSCG Terms of Reference and enhanced by reference to mechanisms of advisory bodies known for the strength of their processes for generating scientific advice. Thoughtful application of these proposals will help the CAOFA Parties lead and serve the larger CAO marine science community now and into the future through a clear, coordinated, and principled program of research and monitoring to better understand the relevant fisheries resources and ecosystems in face of rapid change.

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ENDNOTES

1. The abbreviation RFMO is used in this paper as shorthand for both Regional Fisheries Management Organizations and Regional Fisheries Management Arrangements.
2. Signatories are Canada, China, Denmark (in respect of the Faroe Islands and Greenland), Iceland, Japan, Norway, Russia, South Korea, the United States, and the European Union.
3. The CAOFA acknowledges in its Preamble that the NEAFC “has competence to adopt high conservation and management measures in part of the seas portion of the central Arctic Ocean.”
4. PSCG, 2020, pp. 3-4:
 - TOR 1 Develop Interim Rules of Procedure for the PSCG ...
 - TOR 2 Identify processes and mechanisms to incorporate Indigenous and Local Knowledge, through the inclusion of representatives of Arctic communities, including Arctic indigenous peoples, in the work of the PSCG ...
 - TOR 3 Update the list in the 5th FiSCAO report of current or upcoming scientific activities and platforms of opportunity for scientific mapping work in the [CAO] that could contribute relevant information and data to the [JPSRM] ...
 - TOR 4 Prioritize mapping work based on gaps identified in the 5th FiSCAO report, and any updates to these gaps, and coordinate among Signatories opportunities for conducting scientific mapping work ...
 - TOR 5 Update the Inventory of Monitoring Programs in the High Seas [CAO] and adjacent water.”
5. These workshops grew out of a 2019 meeting of the signatories in Ottawa during which Canada was asked to arrange a workshop on “Indigenous Involvement and Participation” and report back to the PSCG. The Inuit Circumpolar Council (ICC) has sponsored a series of workshops, the first of which, “Co-production Of Indigenous Knowledge and Science for the Central Arctic Ocean Agreement,” took place in Yellowknife, NT, in November 2019. Subsequent workshops have been held virtually. ICC engagement with the CAOFA pre-dates its signing (see ICC-Alaska 2018: para. 50: “Utilize Indigenous Knowledge to advise all future processes of the Central Arctic Ocean Moratorium on Commercial Fisheries).
6. CCAMLR was established by the Convention on the Conservation of Antarctic Marine Living Resources, Canberra, on May 20, 1980; in force April 7, 1982. NAFO was established by the Convention on Cooperation in the Northwest Atlantic Fisheries, Ottawa, on October 24, 1978; in force January 1, 1979.
7. Any such report would need to be submitted for consideration to the Meeting of the Parties by a delegation or delegations. Footnote 5 discusses the origin of these ICC-sponsored workshops.
8. See, e.g., CCAMLR 2009: CCAMLR-XXCVIII/31: In connection with establishing the General Science Capacity Fund and the report of SC-CCAMLR XXVIII China noted “that the mutual understanding and cooperation were of primary importance to the Commission. It was therefore essential to provide for equality of involvement and influence in all parts of the Commission, particularly from Members for which English was not their first language,” and “16.17 The UK recalled that there was a minority of Members providing the majority of scientific advice [... and noted] the potential approaches to addressing this issue, outlined in CCAMLR-XXVIII/31.” Each state participating in CCAMLR is entitled to SC membership but, for various reasons, including capacity and funding, not all can commit to participating at the same level.
9. Despite the requirement for suitable scientific qualifications, CCAMLR has increasingly experienced that the increasing presence of non-scientists in a delegation can slow progress on concluding scientific advice.
10. The abbreviation ATS is used although the Protocol on Environmental Protocol to the Antarctic Treaty, art. 1(e), provides: “Antarctic Treaty system’ [lower case] means the Antarctic Treaty, the measures in effect under that Treaty, its associated separate international instruments in force and the measures in effect under those instruments.” 2491 UNTS 5778, Madrid, January 14, 1998.
11. PSCG 2020, p. 51, Rule 3.d.vi.: “The duties of the Chairperson shall be: vi.to invite external experts to PSCG meetings and its subsidiary bodies. The external experts would not represent a Signatory or organization and would have no status at the meeting other than to provide specific advice and guidance to the PSCG on particular issues.”
12. Shin/Harrison 2019: The purpose was suggested at a workshop that predated the CAOFA: Working session on “An International Science Coordinating Organization for the Central Arctic Ocean (CaO)” Hokkaido University, December

16–18, 2016.

13. IASC revised its Handbook in April 2020 to state the following: “Rather than defining human and environmental boundaries, IASC tries to bridge those boundaries. IASC is also committed to recognizing that Traditional Knowledge, Indigenous Knowledge, and “Western” scientific knowledge are coequal and complementary knowledge systems, all of which can and should inform the work of IASC.” IASC 2020b, p. 2. ICC states in its Food Sovereignty Report: “IK and science are two distinct knowledge systems. With this in mind, it is important not to force or interpret IK into science, but instead allow the two sources of information to work in coordination with each other. Often times, different questions are being asked between IK and science. Both questions are needed to understand the many changes that are occurring.” ICC 2020, p. 125, Box 12.
14. See endnote 5 above.
15. For all five ToRs, see note 4, above. The last three ToRs do not refer explicitly to IK activities and monitoring programs within adjacent areas but could be adjusted to do so.







Dr. Betsy Baker is an international lawyer based in Alaska and a Global Fellow with the Wilson Center Polar Institute. Her consulting work on ocean law and Arctic policy builds on 25+ years of experience as an author, consultant, law professor and, most recently, director of the North Pacific Research Board, an Alaska marine science organization.

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Woodrow Wilson International Center for Scholars
One Woodrow Wilson Plaza
1300 Pennsylvania Avenue NW
Washington, DC 20004-3027

The Wilson Center

 wilsoncenter.org
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 202.691.4000

Polar Institute

Michael Sfraga, Director
Michaela Stith, Project Manager for *Polar Perspectives*

 wilsoncenter.org/polar-institute
 polar@wilsoncenter.org
 facebook.com/ThePolarInstitute
 [@polarinstitute](https://twitter.com/polarinstitute)
 202.691.4320