INTER-AMERICAN TROPICAL TUNA COMMISSION

98TH MEETING
(RESUMED)

(by videoconference)

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DOCUMENT IATTC-98-02b
UNFUNDED PROJECTS

This document lists projects proposed by the IATTC scientific staff that are not funded. The staff's work plans for 2019-2023 and its current and planned research activities are listed in Document SAC-11-01a, and its broader and longer-term goals are set out in Document IATTC-93-06a, *IATTC Strategic Science Plan*.

CONTENTS

A. INTRODUCTION

This document presents brief summaries of 9 research projects that the staff considers important, but lacks the resources, human, technical, or financial, to undertake. The summaries include, for each project, background information, a work plan, and a status report, as well as details of its relevance and purpose, external collaborators, duration, deliverables, and an indicative budget.

Research projects that are funded and/or under way are included in IATTC-94-04; it also contains the staff's work plans, which include many of the projects listed in this document.

The staff's research activities are structured into the seven main areas of research, called *Themes*, of the proposed Strategic Science Plan (SSP; IATTC-93-06a). In addition to better accommodating a strategic planning approach, this new structure is intended to foster stronger collaboration among the different programs (recommendation 17 of the 2016 IATTC Performance Review), with researchers from different programs contributing to activities under a common *Theme*. The seven *Themes,* the strategic pillars of the SSP, are the following:

1. Data collection for scientific support of management
2. Life history studies for scientific support of management
3. Sustainable fisheries
4. Ecological impacts of fishing: assessment and mitigation
5. Interactions among the environment, ecosystem, and fisheries
6. Knowledge transfer and capacity building
7. Scientific excellence

Each *Theme* is divided into strategic *Goals*, and the principal tasks that will be carried out to achieve a

particular goal within the SSP's five-year window are called *Targets* (IATTC-93-06a). The specific activities that the staff will carry out in order to fulfil those tasks are called *Projects*, which are in some cases grouped into *Work Plans* aimed at achieving a broad objective not limited to a particular *Theme* or *Goal*.

The general *Themes*, and the more specific *Goals*, reflect what the staff considers to be its primary responsibilities, and form an integral part of the five-year SSP. The more focused *Targets*, and the concrete *Projects*, are generally of shorter duration, and operate on a biennial cycle. Whether any *Projects* are undertaken under a particular *Goal* or *Target* in any given period will depend on the staff's research priorities, the human, logistic, and financial resources available, and any specific instructions from the Commission.

B. UNFUNDED PROJECTS, BY THEME

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1. DATA COLLECTION FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT C.1.a: Exploring technologies for remote identification of FADs		
THEME: 1. Data collection **GOAL:** C. Improve quality and expand coverage of data-collection programs **TARGET:** C.1. Purse-seine fleet **EXECUTION**: Bycatch Mitigation and Gear Technology Group & Stock Assessment Program		
Objectives	• Evaluate the suitability of different technologies to remotely and electronically identify FADs	
Background	• FADs may cause significant impacts species and ecosystems. • Assessing impacts require efficient collection methods for high-quality data, including correct tracking and monitoring of individual FADs throughout their lifetime. • Currently, FADs are identified using satellite-buoy identifiers, and appropriately obtaining buoys' alphanumeric serial numbers has traditionally been difficult for observers, and not possible with current EMS capabilities. • However, this information is key to merge and connect different IATTC databases. • EMS can generate certain data on FADs (e.g. deployments, removals) but only those types of data that can be collected with cameras. • An electronic system to automatically detect and identify FADs would improve the value and utility of all types of data, but particularly of data collected by EMS. • Several technologies for remote identification of objects are currently on the market. These technologies should be tested under controlled conditions to better understand their advantages and disadvantages.	
Relevance for management	Technologies to remotely identify FADs would improve data collection and analyses and the development of comprehensive management recommendations for target and non-target species in the EPO.	
Duration	12 months	
Work plan and status	• [M 1-3] Preliminary assessment of candidate technologies and providers; purchase equipment. • [M 4-9] Test technologies under controlled conditions in the Achotines lab, Panama, gradually increasing distance between the FAD and the device used for detection and the potential severity of environmental conditions: tanks, coast, bay and open sea. • [M 10-12] Report writing.	
External collaborators	Satlink and Digital Observer Services (DOS)	
Deliverables	• Reports for the FAD WG and the SAC with the summary of pros and cons of all the technologies considered, with specific proposals on preferred technologies for remote FAD identification and a future action plan.	
Budget (US$)	Purchase of technology for remote identification	20,000
	Collaborators time	30,000
	Travelling	10,000
	Total (excluding staff time)	60,000
	Staff time	10% FTE

2. LIFE-HISTORY STUDIES FOR SCIENTIFIC SUPPORT OF MANAGEMENT

PROJECT E.2.a: Investigate spatiotemporal variability in the age, growth, maturity, and fecundity of yellowfin tuna in the EPO		
THEME: Life-history studies for scientific support of management **GOAL:** E. Life history, behavior, and stock structure of tropical tunas **TARGET:** E.2. Reproductive biology of tropical tunas **EXECUTION**: Life-history and Behavior Group		
Objectives	Estimate age, growth, maturity, and fecundity of yellowfin from four distinct areas of the eastern Pacific for use in spatially-structured stock assessment models	
Background	• Current estimates of age, growth, maturity, and fecundity of yellowfin are based on otolith and ovarian tissue samples collected over 30 years ago. • During 2009-2016 observers collected otolith and ovarian tissues samples at sea throughout the EPO • Tagging and morphometrics data indicate there are multiple stocks of yellowfin in the EPO, probably with different life history characteristics • Heavily-exploited fish stocks often show trends towards earlier maturation • Spatially-structured stock assessments should incorporate geographically-explicit life-history parameters	
Relevance for management	Spatially-structured stock assessments based on geographically-explicit life history parameters will provide a more accurate basis for the staff's management advice	
Duration	5 years; initiated in 2017	
Work plan and status	• 2017-2021: Preparation and reading of otolith samples for age estimates • 2019-2021: Preparation and reading of ovarian tissues for fecundity estimates • 2021: Analyses of age and growth and reproductive biology data, and preparation of manuscripts The life-history group will be very occupied with the tagging program (E.4.a) in 2020 and have very limited time for this project. A laboratory technician will be needed to avoid major delays with this project.	
External collaborators		
Deliverables	• Presentation for SAC-12, 2021 • Updated, geographically-explicit life-history parameters for use in spatially-structured stock assessments	
Budget (US$)	Laboratory technician (1 year)	60,000

3. SUSTAINABLE FISHERIES

PROJECT H.1.d(ext): Improve indices of abundance and length composition based on longline data	
THEME: Sustainable fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program	
Objectives	• Improve the yellowfin and bigeye indices of relative abundance from longline data • Determine methods to identify targeting in longline fisheries • Develop spatio-temporal models for creating indices of relative abundance from longline data • Develop appropriate longline length-composition data for the index of abundance and for the catch • Continue the ongoing collaborative work
Background	• Indices of relative abundance derived from longline CPUE data are the most important piece of information in the bigeye and yellowfin stock assessments • Only the Japanese data are currently used to create these indices • The characteristics, tactics, and spatial distribution of the fishery have changed over time • The same length-composition data are used for the index and for the catch, but these could differ • Collaborative research and a workshop in 2019 have substantially progressed the work towards achieving the objectives. • New methods, such as spatio-temporal modelling, have been developed and are used in the creation of the indices • Additional research is needed to address changes in target species and factors that may change catchability so better indices of abundance by size class can be estimated • Access to operational-level data for longer time periods is essential for advancing the research. Several CPCs have granted such access to the staff under bilateral MoUs renewable. • The staff is recommending changes in the data submission to facilitate the research on longline data • Research conducted to resolve issues in using the longline CPUE and composition data needs to be presented and discussed with scientists of the relevant CPCs
Relevance for management	The indices have a direct impact on the stock assessment, and any improvements in the indices will directly improve the management advice for bigeye and yellowfin
Duration	Winter 2022
Work plan and status	• 2020-2022: work with CPC scientists to progress longline research • Winter 2022: workshop preparation. • Spring/Summer 2022: one-week workshop to discuss the results of the research conducted to resolve issues in using the longline CPUE data, write workplan to finish the work. • Summer/Fall 2022: write workshop report, manuscript on longline indices of abundance • Fall 2022:
External collaborators	• CPCs involved in the longline fishery, mainly China, Japan, Korea, Chinese Taipei • Invited speakers
Deliverables	• Workshop report • Indices of relative abundance

	• Length compositions • Project report to SAC-14, 2023	
Budget (US$)	Workshop and research expenses and invited participant travel costs	50,000

PROJECT H.1.f: Workshop on improving spatio-temporal methods for tuna CPUE and length composition standardization	
THEME: 1. Sustainable Fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program	
Objectives	• Develop guidelines for tuna CPUE standardization with spatio-temporal methods, including specification of complex correlation structures. • Develop guidelines for tuna length composition standardization with spatio-temporal methods, including the specification of length bin and among-length bin correlation structure. • Develop standard model diagnostics to assess model fit, and to compare to fitted models from other methods. • Develop workplan for addressing remaining issues and improving methods.
Background	• Spatio-temporal modeling is a new technique for developing indices of relative abundance and length composition that shows considerable promise. • To date its application to tuna species has proved problematic because of the sparse coverage of fishery-dependent data relative to the species' habitat, expansion and contraction of fisheries, preferential sampling, and because the effects of habitat spatial heterogeneity on catch rates require complex correlation structures on multiple scales that are difficult to implement. • Currently, there are only limited guidelines for model development and selection, and a lack of standard diagnostics available to assess model fit, especially as regards evaluation of spatio-temporal correlation structures. • These shortcomings have severely limited adoption of this new technique, even though it has been shown to hold promise for some species in certain regions.
Relevance for management	Modelling guidelines, diagnostics, and methodological improvements will make the technique accessible to more fisheries scientists, thereby improving tuna CPUE and length composition standardization methodology and assessments worldwide.
Duration	Three days in late spring/summer 2021, after SAC-12.
Work plan and status	• Summer/Fall 2021: invite experts, secure venue. • Winter 2022: workshop preparation. • Spring/Summer 2022: conduct workshop, write workplan. • Summer/Fall 2022: write workshop report, manuscript on model diagnostics.
External collaborators	Shannon Cass-Calay, Southeast Fisheries Science Center, NMFS James Thorson, Alaska Fisheries Science Center, NMFS Nicholas Ducharme-Barth, SPC [not fully confirmed] Paul de Bruyn, IOTC
Deliverables	• Report for SAC-13 and the Commission that outlines modeling guidelines and model diagnostics appropriate for spatio-temporal methods for tuna CPUE and length composition standardization. • Workplan for addressing remaining issues and improving methods. • Manuscript on model diagnostics for spatio-temporal methods to be submitted to a peer-reviewed fisheries journal.

Budget (US$)	Regional workshop (includes travel/accommodations for several invited experts; coffee breaks for all workshop participants)	$50,000
	Total	**$50,000**

PROJECT H.1.g: Workshop on improving metrics and their scoring for the IATTC risk analysis		
THEME: 1. Sustainable Fisheries **GOAL:** H. Research and development of stock assessment models and their assumptions **TARGET:** H.1. Improve routine tropical tuna assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Develop more objective, transparent, and automated scoring of metrics for weighting models. • Improve metrics used for weighting models in the IATTC risk analysis.	
Background	• Uncertainty is an inherent quality of fisheries stock assessment and management • Uncertainty should be taken into consideration when making management decisions • Model uncertainty is a major component of the total uncertainty • Ensemble modelling requires defining weights for each model • The IATTC staff has developed a risk analysis approach to provide management advice that takes into consideration model uncertainty • The current method used to weight models it subjective • There are several groups that are currently working on diagnostics or ensemble modelling, and bringing them together with other stakeholders in a workshop would greatly benefit the effort to improve the IATTC risk analysis.	
Relevance for management	• More objective, transparent, and automated scoring of metrics for weighting models will greatly improve the risk analysis currently used for managing tropical tunas in the EPO. • It will also increase understanding and acceptance by stakeholders	
Duration	Three days in Fall/Winter 2022	
Work plan and status	• Spring 2022: invite experts, secure venue. • Summer 2022: workshop preparation. • Fall/Winter 2022: conduct workshop. • Winter: write workshop report, manuscript on model scoring metrics.	
External collaborators	Scientists from other tRFMO's and other fisheries management organizations	
Deliverables	• Report for SAC-14 and the Commission that outlines more objective, transparent, and automated metrics for scoring models. • Manuscript on model scoring metrics to be submitted to a peer-reviewed fisheries journal.	
Budget (US$)	Regional workshop (includes travel/accommodations for several invited experts; coffee breaks for all workshop participants)	$50,000
	Total	**$50,000**

PROJECT H.7.d: Develop priors for shark stock-recruitment relationships		
THEME: Sustainable fisheries **GOAL**: H. Improve and implement stock assessments, based on the best available science **TARGET**: H.7. Develop conventional stock assessments for data-rich prioritized species and species of specific interest **EXECUTION**: Stock Assessment Program		
Objectives	• Assemble the available information from theory and data about density dependence in the stock-recruitment relationship for low-fecundity species • Develop priors for shark stock-recruitment relationships	
Background	• Sharks and a major conservation concern in the EPO and worldwide • Stock assessments have been developed for several species and are planned for many more • The IATTC has conducted its own assessments and collaborates with assessments conducted by the ISC • Proposed Close Kin Mark Recapture will improve stock assessments • One of the main uncertainties in shark stock assessments is the stock-recruitment relationship • A stock-recruitment relationship that is based on density-dependent survival has been developed for low-fecundity species and is applicable to sharks • The low-fecundity stock-recruitment relationship has been implemented in Stock Synthesis, the program used for several shark stock assessments • The low-fecundity stock-recruitment relationship has one more parameter than the traditionally used stock-recruitment relationship and it is difficult to estimate all three parameters in most, if not all, applications. • Prior information on the stock-recruitment parameters is needed.	
Relevance for management	• The stock-recruitment relationship is a main determinant of management reference points • Better understanding of the stock-recruitment relationship will improve assessments and management of sharks	
Duration	24 months, starting January 2022	
Work plan and status	• Jan-June 2022: Assemble and review all relevant information on the theory of density-dependent recruitment for low-fecundity species • July-Dec 2022: Assemble and review all relevant data on density-dependent recruitment for low-fecundity species • Jan-June 2023: Assemble and review all relevant information on the theory and data of density-dependent recruitment in sharks • July-Dec 2023: Assimilate all the information to determine priors for the low fecundity stock-recruitment relationship with respect to sharks.	
External collaborators	ISC	
Deliverables	Project report to SAC	
Budget (US$)	Post-doctoral researcher, 2 years @ US$125,000	250,000
	Relocation costs	5,000
	Travel	10,000
	Computer equipment	10,000
	Total	275,000

PROJECT H.7.e: Feasibility and sampling design for close-kin mark-recapture analysis of stocks in the EPO		
THEME: Sustainable fisheries **GOAL:** H. Improve and implement stock assessments, based on the best available science **TARGET:** H.7. Develop conventional stock assessments for data-rich prioritized species and species of specific interest **EXECUTION**: Stock Assessment Program		
Objectives	• Evaluate the feasibility of conducting close-kin mark-recapture (CKMR) for stocks in the EPO. • Develop sampling designs for bigeye tuna, silky shark, and hammerhead sharks. • Evaluate tissue quality for genetic analysis from different sampling methods.	
Background	• Estimates of absolute abundance are uncertain for many species. • The bigeye tuna assessment is uncertain, with a group of pessimistic models with low biomass and a group of optimistic models with high biomass. • Times series of data for the silky shark, hammer head sharks, and other shark species are not sufficiently reliable to conduct stock assessments or monitor stock status. • EPO-wide traditional tagging studies are difficult and expensive to conduct. • The newly developed CKMR method can estimate absolute adult abundance and adult survival. • CKMR data can also provide information on stock structure, which is missing for most stocks. • CKMR avoids issues associated with traditional tagging studies, such as releasing fish alive, tagging related mortality, tag loss, and misreporting.	
Relevance for management	• Estimates of adult abundance and mortality will greatly improve stock assessments. • CKMR would resolve the issues with uncertainty in absolute abundance in the bigeye tuna stock assessment and greatly improve the management advice. • CKMR, combined with the estimates of total catch from the recently introduced catch sampling program for sharks, could provide estimates of fishing mortality that could be compared with reference points to determine the status of shark stocks.	
Duration	2022	
Work plan and status	• January: initiate contract a desktop feasibility study, sampling design, and budget for sample collection for bigeye tuna, silky shark, and hammerhead sharks. • May: Workshops on sampling opportunities for a) purse seine vessels and b) longline vessels • July: Conduct an onsite study of sampling feasibility and tissue quality for multiple sampling methods in multiple fisheries, including the necessary field and lab work.	
External collaborators	• CPCs involved in the relevant fisheries • SPC and WCPFC • Contractors	
Deliverables	• Feasibility study report presented at SAC 2023	
Budget (US$)	Desktop Feasibility study and sampling design Onsite sampling feasibility study Total per species Workshops on sampling opportunities Bigeye and silky shark (hammer heads can be evaluated by the IATTC staff based on the silky shark study)	50,000 50,000 100,000 50,000 250,000

4. ECOLOGICAL IMPACTS OF FISHERIES: ASSESSMENT AND MITIGATION

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5. INTERACTIONS AMONG THE ENVIRONMENT, THE ECOSYSTEM, AND FISHERIES

PROJECT O.1.a: Develop a fishery-dependent ecological sampling program for EPO tuna fisheries		
THEME: Interactions among the environment, the ecosystem and fisheries **GOAL:** O. Improve understanding of the EPO ecosystem **TARGET:** O.1. Conduct trophodynamic studies for defining key assumptions in EPO ecosystem models **EXECUTION**: Biology and Ecosystem Program		
Objectives	• Undertake a pilot fishery-dependent sampling program to collect biological and ecological information for species impacted by EPO fisheries to improve our understanding of the potential ecological effects of fishing and climate change. • Use collected data to develop ecological indices and parameterize ecological risk assessment and ecosystem models for supporting EBFM.	
Background	Studies on trophic ecology, using stomach contents, stable isotopes and fatty acids, are essential for parameterizing ecosystem models and for developing ecological indices to assess the ecological impacts of fishing. Mid-trophic forage species for example form critical trophic linkages from the bottom to the top of the food web, but are poorly understood, therefore limiting overall efficacy of forecasting changes in ecosystem structure under fishing and/or climate change scenarios. Before an EPO ecological sampling program can be established, a pilot study is needed to determine what is feasible and cost-effective using fishery-dependent methods.	
Relevance for management	Accurate depictions of trophic connections are the foundation of ecosystem models that represent and quantify the complexity of ecological interactions among species or functional groups. Improving our understanding of the trophodynamics of the pelagic EPO by undertaking comprehensive trophic ecology studies for populating ecosystem models provides an important step towards evaluating ecological sustainability under the Antigua Convention.	
Duration	18 months	
Work plan and status	• Jan-Apr 2021: identify priority species, develop determine research logistics (e.g. cost, storage, supplies, etc.), and finalize a sampling protocol for the pilot study • May-Dec 2021: undertake fishery-dependent sampling of fish and elasmobranch stomachs and other tissue for trophic analyses; develop database to house sample information; systematically store stomach contents for later identification • Jan-Mar 2022: produce a report documenting sampling collections and a feasibility analysis for a larger-scale ecological sampling program.	
External collaborators	CPCs, purse-seine fishers, universities, government agencies.	
Deliverables	• Development of a cost-effective ecological sampling program for the EPO based on field-based results from the pilot project. • An ecological database to store trophic and ecological information for a larger-scale ecological sampling program to support ecological objectives of the IATTC	
Budget (US$)		**85,000**

6. KNOWLEDGE TRANSFER AND CAPACITY BUILDING

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7. SCIENTIFIC EXCELLENCE

PROJECT T.1.a: External review of bigeye tuna assessment		
THEME: Scientific Excellence **GOAL:** T. Implement external reviews of the staff's research **TARGET:** T.1. Facilitate external reviews of stock assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Review the assessment model used for bigeye tuna • Improve the assumptions made in the assessment	
Background	• The bigeye tuna stock assessment was last independently reviewed in 2019 • A new risk assessment approach that includes fourteen reference models for bigeye tuna in the EPO has been developed since the last review • Review of the assessment is important to get external input into improving the assessment	
Relevance for management	• The results of the bigeye assessment are used for management advice • Improvements in the stock assessment will improve the management advice	
Duration	The project will extend over 2024 but the workshop will be a single week in Fall	
Work plan and status	• Early 2023: Identify review panel • Mid 2023: Prepare documents describing major developments in the model • Summer/Fall 2023: Hold workshop • Fall 2023: Write workshop report	
External collaborators	Independent reviewers	
Deliverables	Workshop report	
Budget (US$)	Workshop expenses and invited participant travel costs	50,000

PROJECT T.1.b: External review of yellowfin tuna assessment	
THEME: Scientific Excellence **GOAL:** T. Implement external reviews of the staff's research **TARGET:** T.1. Facilitate external reviews of stock assessments **EXECUTION**: Stock Assessment Program	
Objectives	• Review the assessment model used for yellowfin tuna • Improve the assumptions made in the assessment
Background	• The yellowfin tuna stock assessment was last independently reviewed in 2019 • A new risk assessment approach that forty-eight models for yellowfin tuna in the EPO was implemented in the 2020. • A workplan is in place to improve the assessment and address stock structure hypothesis were not fully addressed in the 2020 benchmark assessment, • Review of the assessment is important to get external input into improving the assessment
Relevance for management	• The results of the yellowfin assessment are used for management advice • Improvements in the stock assessment will improve the management advice
Duration	The project will extend over 2024 but the workshop will be a single week in Fall
Work plan and status	• Early 2023: Identify review panel • Mid 2023: Prepare documents describing major developments in the model

	• Fall 2023: Hold workshop • Fall 2023: Write workshop report	
External collaborators	Independent reviewers	
Deliverables	Workshop report	
Budget (US$)	Workshop expenses and invited participant travel costs	50,000

PROJECT T.1.c: External review of skipjack tagging analysis		
THEME: Scientific Excellence **GOAL:** T. Implement external reviews of the staff's research **TARGET:** T.1. Facilitate external reviews of stock assessments **EXECUTION**: Stock Assessment Program		
Objectives	• Review the tagging analysis used for skipjack tuna • Improve the assumptions made in the analysis	
Background	• No assessment is available for skipjack tuna • A workplan is in place to develop an assessment • The assessment will be based on a newly developed method to abnalyse the recnt tagging data • An external review is important to get input into improving the analysis	
Relevance for management	• Management advice for skipjack is based on the assessment of bigeye tuna • The results of the skipjack assessment will be used for management advice	
Duration	2022	
Work plan and status	• Early 2022: Identify review panel • Mid 2022: Prepare documents describing major developments in the model • Summer/Fall 2023: Hold workshop • Fall 2023: Write workshop report	
External collaborators	Independent reviewers	
Deliverables	Workshop report	
Budget (US$)	Workshop expenses and invited participant travel costs	50,000

PROJECT X.1.c: Workshop on good practices in fisheries stock assessment		
THEME: Scientific excellence **GOAL**: X. Promote the advancement of scientific research **TARGET**: X.1. Continue the annual CAPAM workshops **EXECUTION**: Stock Assessment Program		
Objectives	Initiate the development of a good practices guide for the application of stock assessment models	
Background	• Assumptions made in stock assessments vary widely among applications • There is no clear agreement on the best assumptions • There has been substantial progress made recently in understanding stock assessment models • CAPAM has held (or will hold) workshops on all the key population and fishery processes • CAPAM's major focus is the Program on Good Practices in Stock Assessment Modeling • The workshop will provide the background information to develop the good practices guide	
Relevance for management	• Stock assessments are the basis for the staff's management advice • Several aspects of the stock assessments need to be improved • A good practices guide will help improve the assessments	
Duration	18 months	
Work plan and status	• Fall 2021: invite keynote speakers • Winter-Summer 2022: prepare background materials • Fall 2022: conduct workshop, write workshop report • May 2023: report to SAC-14	
External collaborators	Invited speakers	
Deliverables	Workshop report	
Budget (US$)	Workshop expenses and invited participant travel costs	50,000