Scientific Committee on Oceanic Research Working Group Proposal | May 2024

Global Integration of Seabird Time Series

GISTS (pronunciation: /dʒɪsts/)

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Summary/Abstract

Building upon previous successful projects that began to integrate biological time series across the globe, we will design and implement a SCOR-supported working group to enhance global seabird science by: i) harmonizing datasets on a global scale, (ii) developing priorities and recommendations for future research, with a focus on key questions and long-term monitoring, iii) engaging in outreach activities to connect researchers from regions not yet included in global analyses into the wider community of seabird science, and iv) building capacity for future global integrations of seabird data by engaging early career ocean professionals (ECOP). In a rapidly changing marine environment, there is an increasing recognition of seabirds as ecological indicators of the stability and function of ocean ecosystems. Our proposed SCOR working group will formalize a group of scientists currently collaborating on global seabird meta-analyses (e.g., Sydeman et al. 2021) which are prioritizing the characterization of environmental impacts on seabird reproductive trends.

Scientific Background & Rationale

Under climate change, marine ecosystems are changing at an unprecedented rate, with important and complex effects on all marine life (Bindoff et al. 2019). Specific mechanisms linking climate change-induced environmental changes to top marine predators are often poorly understood. As warming, increasing stratification, and changing patterns of primary productivity have already lead to rapid ecological shifts, and are expected to continue to do so in the coming decades, there is an urgent need to enhance understanding and develop robust indicators and sentinels to change that can be assessed, reported upon, and integrated into management and policy in near-real time. Seabirds, as inhabitants of the air-sea ecotone, are one of the most conspicuous animal groups in marine ecosystems. Seabirds thereby provide unique opportunities to meet societal needs for better scientific understanding of climate effects on marine systems as well as providing a means to detect and quantify change across remote, vast, and poorly known regions of the world's oceans.

A Primer on Seabirds

Seabirds are endothermic, with constant body temperature and metabolism, meaning that climate change and variability affects them mostly through indirect oceanographic mechanisms that may alter the abundance or accessibility of their mid-trophic level food resources (e.g., upwelling effects on secondary productivity and availability; Poloczanska et al. 2013, Keogan et al. 2018). Some direct effects may also occur, such as coastal inundation of low-lying breeding colonies in tropical areas due to sea level rise. Owing to their conspicuousness at land- and ice-based breeding colonies (e.g., Emperor penguins), as well as their visibility at the air-sea interface while migrating or foraging, seabirds are an extremely well-studied taxa (Wooller et al. 1992, Sydeman et al. 2015). Seabirds also entice substantial public interest. Importantly, detailed and highly robust (precise, large sample sizes) datasets are already available on a variety of seabird population traits, food habits, and other potential responses to environmental variability; breeding success and diet composition are particularly well studied at the local scale. However, efforts to synthesize global seabird data to understand the oceans has been

hampered by a general lack of coordination and cooperation, which is clearly needed to advance the field of global seabird science. Moreover, geographic disparities in funding and related data availability, access to technical training and computing resources, and lack of connectivity between widespread researchers and the broader marine science community has led to systematic gaps in understanding of climate effects on seabirds and ecosystems around the world, especially for low-latitude regions. Our working group will tackle these challenges and impediments to global seabird science.

Observing Seabirds: Understanding Oceans

Despite widespread seabird research around the world, locations of research activity are not evenly distributed in space. An ongoing global meta-analysis of seabird breeding success has shown that seabird data are unavailable from wide swathes of the globe, including the Tropical Atlantic, Tropical Eastern Pacific, and the Eastern Indo-Pacific, and data availability is severely limited in the Central and Western Indo-Pacific regions (Sydeman et al., *in prep*). The dearth of information in these, mostly tropical, regions is problematic from two standpoints. First, the tropics and equatorial regions of the world are key areas for global climate change, especially spatial shifts in marine surface isotherms characterized by the “velocity of climate change” (Burrows et al. 2011, Sydeman et al 2021). Second, seabird families of the tropics and equatorial regions differ from those in temperate and polar regions, thus the biophysical patterns linking seabirds to their environment observed elsewhere in the world may not necessarily be informative of patterns at lower latitudes. Consequently, direct observation of predators at low latitudes is essential to understanding how climate change is impacting these ecosystems and monitoring the vulnerability of uniquely adapted taxa.

Previous collaborative work of seabird researchers from around the world has already led to better understanding of seabirds and ecosystem function (Sydeman et al. 2021; *manuscripts in prep*). We seek to further connect researchers in this field to continue to better develop professional networks, project collaborations, and available datasets, with particular consideration for regions of the world with research programs that are currently under-represented in global analyses. **Areas of specific focus for this working group will be: (1) examination of limiting and enabling conditions for future participation of researchers from areas under-studied in global analyses, (2) development of shared protocols, (3) identification of key research directions for global seabird science, (4) engagement of researchers worldwide, and (5) capacity building by training ECOP.**

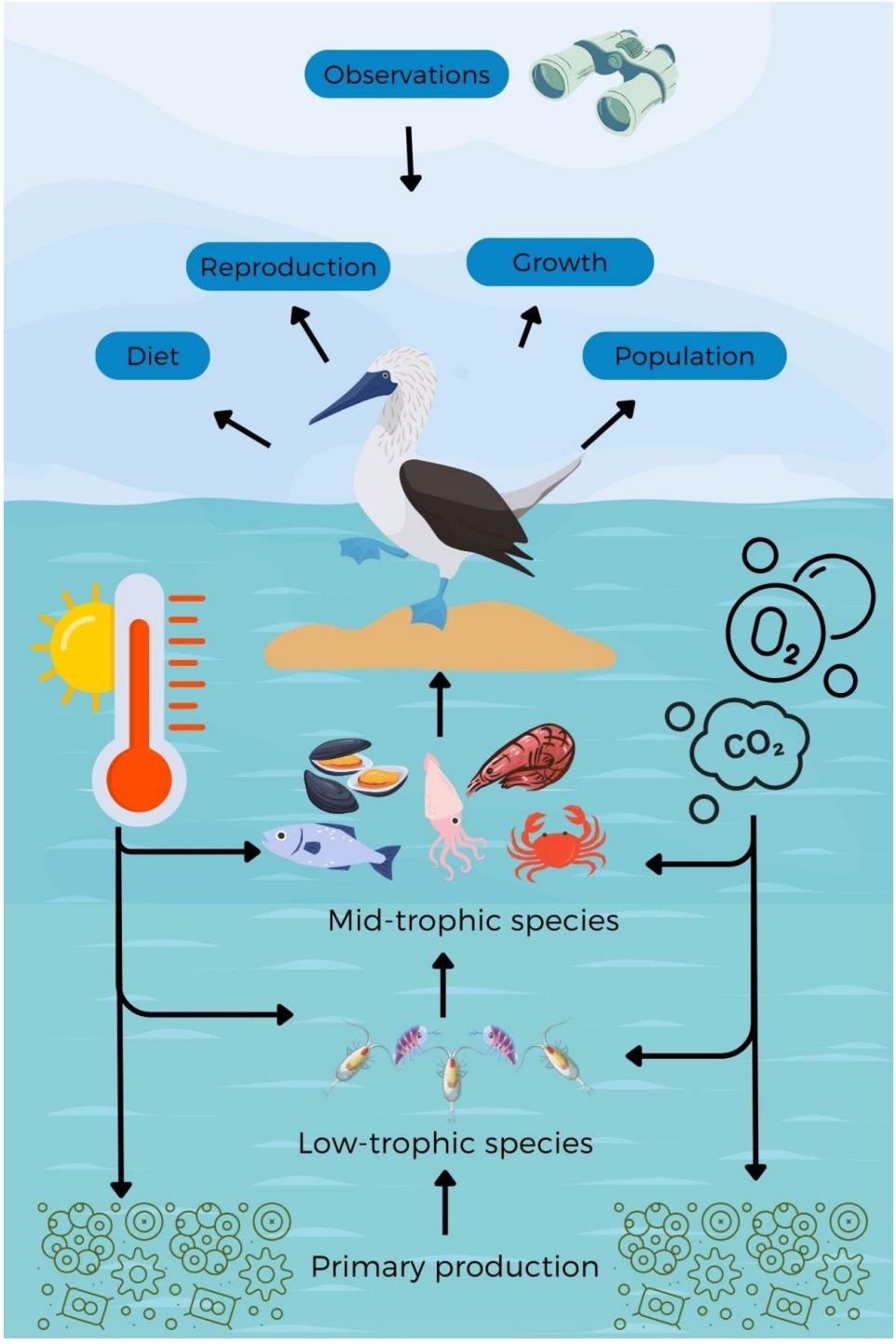

Figure 1 | Simplified diagram of marine food web with seabird top predator and how seabirds can be studied. Trophic linkages demonstrate how oceanic and climate variability can influence top predators indirectly via ecosystems.

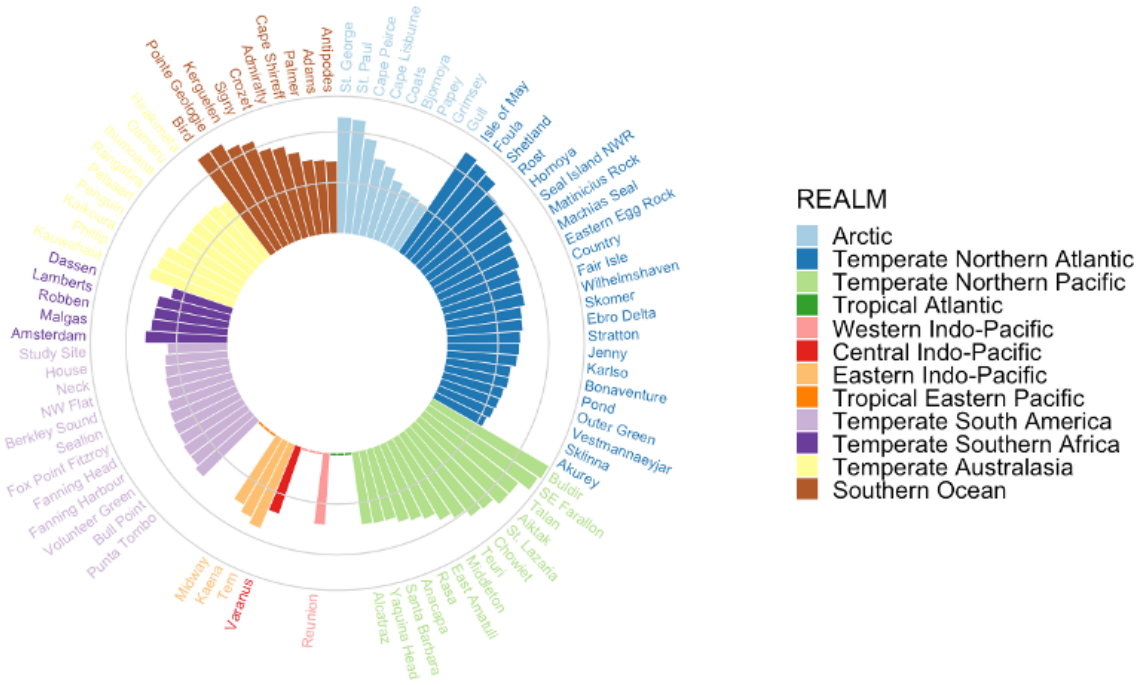

Figure 2 | Radar plot showing the number of time series from sites (colonies) where seabirds have been studied around the world. Bars are colored by the oceanic realm to which the colony belongs. Gray lines indicate the number of observations available at each site on a log scale: inner (n=10), middle (n=100), outer (n=500). The dearth of observations from the tropics is clear.

The Need for a SCOR Working Group

In order to facilitate a global understanding of what seabirds, and other top predators, can tell us about changing oceanic conditions and marine ecosystem ‘health’, it is necessary to bring together researchers from diverse regions to harmonize data and consider how to best integrate regionally-specific data collection, collation, and synthesis efforts to enhance global-scale investigations. Data integration will involve sharing and alignment of data collection and refinement protocols and analytical approaches, identification of key research gaps and limiting resources, and the leveraging of existing resources and professional networks to fill needs. These activities are often under-resourced in professional marine ecological communities and lack the structure required to make them impactful and long-lasting. Establishment of a SCOR Working Group dedicated to advancing global seabird science will help to address these needs by providing a structure to identify and address limiting conditions, and funding to enable the participation of a geographically diverse group of early-career and established researchers.

Terms of Reference

TOR 1 Survey the seabird research community to characterize the limiting and enabling conditions for global seabird science with a focus on currently under-represented regions (tropical and sub-tropical marine ecosystems).

TOR 2 Develop and share protocols across programs to enhance within- and between-region and time period data collection (e.g., fieldwork methods), summarization (e.g., spatial, seasonal and annual averaging, summation within taxonomic and age categories), and refinement (e.g., exogenous factor treatment, methods to deal with gaps in time series and other statistical issues).

TOR 3 Based on the above, develop priorities and recommendations for future global seabird science research (and monitoring efforts in some cases), and develop detailed metadata structures for enhancement of existing data archives.

TOR 4 Engage in outreach activities to connect with seabird researchers in regions currently under-represented in global seabird science and analyses, and implement, i.e., build capacity, for establishing or maintaining long-term connections with key senior and junior (Early Career Ocean Professionals [ECOP]) personnel in these regions.

TOR 5 Identify and consolidate a globally representative dataset of long-term oceanic and colony-based seabird time series and related ecosystem data. Assemble time series into a database (pending permissions) publicly available for future analysis.

TOR 6 Build capacity for future global seabird analyses by promoting ECOP and other early career scientists into leadership roles.

Deliverables (250 words)

We anticipate producing the following deliverables through the activities of this working group. Each deliverable is linked to one or more of the GISTS terms of reference.

D1 Develop and share a queryable database of colony-derived seabird observations and other related time series populated by contributions from working group members (**TOR 5**). Database population will continue beyond the working group following the conclusion of the working group term. The database will be made publicly available via Zenodo, the Environmental Data Initiative, or a similar platform.

D2 Develop and share protocols and best practices for data collection, summarization, and refinement, building capacity for seabird research globally (**TOR 2**). Publish protocol documents in the Ocean Best Practices Repository.

D3 Share research recommendations with the broader scientific community by publication of a group-authored original research article on the results of **TOR 3.**

D4 Showcase the importance of and enabling conditions for long-term colony monitoring, particularly in regions currently under-represented in global studies (**TORs 1 and 4**), through publication of a short format article (e.g., comment).

D5 Presentation showcasing GISTS working group activities and theory of change as well as preliminary findings associated with **TORs 1 and 4** at the World Seabird Conference. GISTS working group member(s) will deliver the presentation.

Working Plan

In this section, we describe, in narrative form, our plans to achieve each of our proposed terms of reference. These activities are also summarized in a tabular format (**Table 1**).

TOR 1 | Survey seabird research community

We will identify a survey subcommittee during the first virtual convening of the GISTS working group in 2025. This subcommittee will be responsible for developing and circulating a survey to examine the limiting and enabling conditions for seabird colony monitoring programs around the world. Dr. Killeen (Affiliate Chair) has experience developing surveys for similar purposes and will be a member of the survey subcommittee. To maximize participation in the survey and minimize costs, the survey will be developed using freely available online platforms (e.g., Qualtrics) that are broadly accessible in most countries. The survey will include a mix of constrained questions (e.g., multiple choice and ranked responses), to enable quantitative comparisons across regions, and narrative questions which aim to solicit more detailed information about context-specific constraints. The survey will be circulated via the existing GISTS membership networks, through listservs (e.g., ECOLOG, Ornithology Exchange, Pacific Seabird Group, The Seabird Group, World Seabird Union), organizations (e.g., Women in Seabird Science), and regional research and conservation nodes (e.g., universities and NGOs). Survey findings will be analyzed and discussed (in working group meetings) during 2026 and will be published in 2027 (**D4**). We will also provide a preliminary report of survey findings and working group activities at the World Seabird Conference in Hobart, Australia, in 2026 (**D5**).

TOR 2 | Develop and share protocols

We will identify a database/protocols subcommittee during the first virtual convening of the GISTS working group in 2025. This subcommittee will be tasked with leading and coordinating efforts to meet the requirements of **TORs 2 and 5.** The subcommittee will begin in 2025 by requesting data collection, summarization, refinement, and sharing protocols from GISTS members. Throughout 2026, the subcommittee will work to synthesize protocols and present this to the full working group. During the hybrid meeting in Hobart, Australia in 2026, and in

virtual meetings in Q2 2027, the working group subcommittee will work to integrate protocols and best practices into a single document that can be shared publicly.

TOR 3 | Identify research objectives

Beginning in 2026, the Chair, Dr. William Sydeman, will facilitate virtual discussions during working group meetings to identify key objectives for large-scale, integrative seabird research. Research prioritization will build upon and be informed by survey and database/protocol subcommittee activities. These conversations will be synthesized in an original article that will be submitted to a peer-reviewed journal in Q3 or Q4 of 2027.

TOR 4 | Engage seabird researchers

Throughout the working group duration, we will leverage the professional networks of each working group member engage in outreach activities to connect with seabird researchers in regions currently under-represented in global seabird monitoring and analyses. These efforts will use accessible themes in seabird ecology to build capacity for marine education and communication in collaboration with regional personnel.

TOR 5 | Consolidate available time series

The working group, led by the database/protocol subcommittee, will identify and consolidate a globally representative dataset of long-term oceanic and colony-based seabird time series and related ecosystem data. An already extensive dataset for global seabird breeding success has been curated for previous projects (Sydeman et al. 2021, papers *in prep*), and will serve as the starting point of the new database. Working group members will, through outreach engagement (**TOR 4**), facilitate the expansion of this dataset and the procurement of others that will populate the database. Other long-term data for seabird metrics/responses include population, behavior, diet, or condition (**Figure 3**). Data that can be used in analysis as information about environmental drivers or intermediate factors in indirect effects of environmental change on seabirds will also be included in the database (“Ecosystem metrics”). All database tables will be relational and will be made publicly available via Zenodo, the Environmental Data Initiative, or similar platforms.

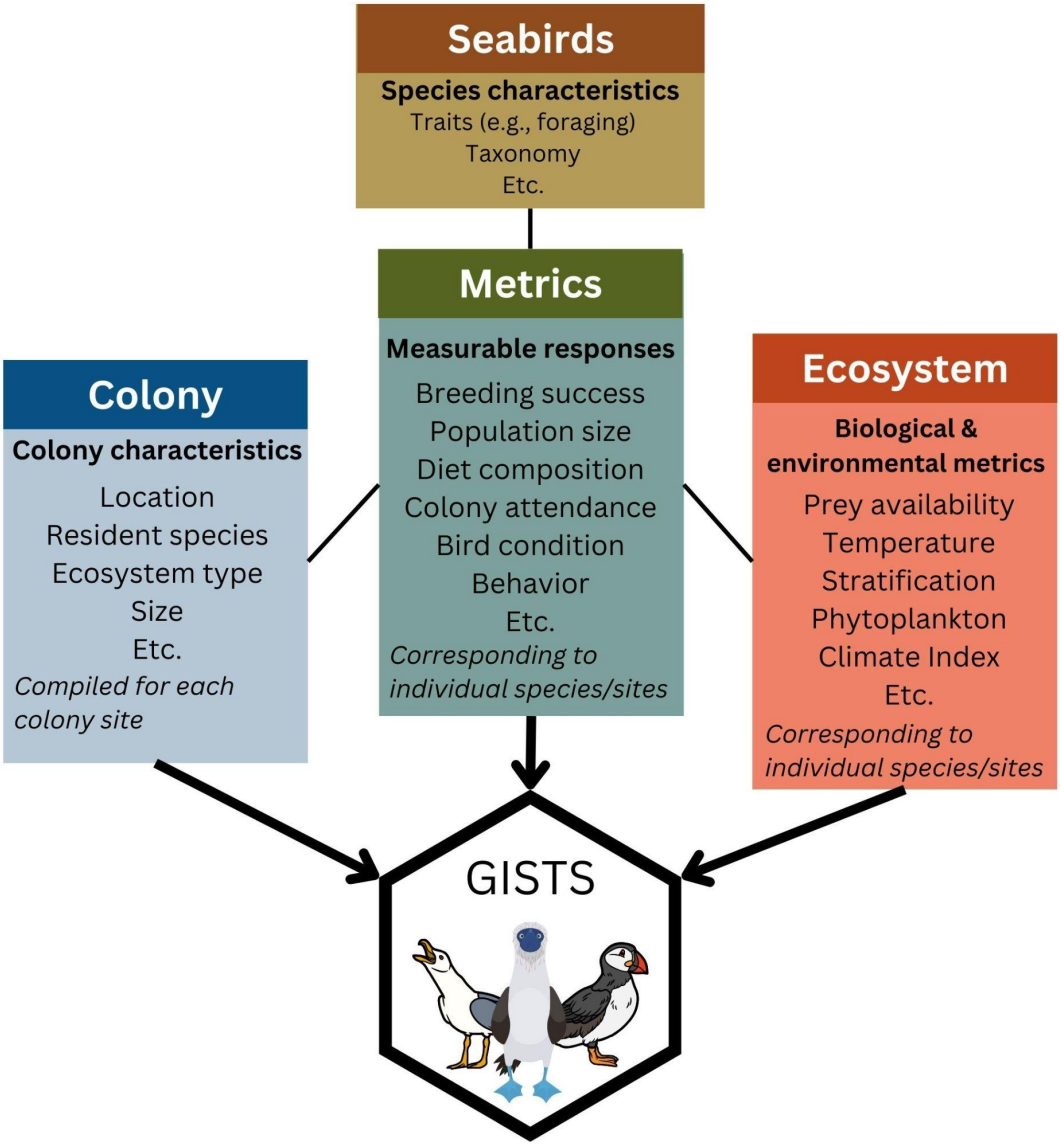

Figure 3 | A schema representing a possible relational structure of the GISTS seabird colony database.

TOR 6 | Promote ECOP leadership

Full and affiliate ECOP members will be offered development opportunities throughout the lifespan of the working group (e.g., subcommittee participation, meeting discussions, conference attendance, preparation and presentation of annual reports, published manuscripts, and oral presentations). Additional ECOP development will take place via activities related to **TOR 4**, which will occur throughout the working group duration.

Table 1 | Project management timeline shown as a Gantt chart. The timing of specific tasks described in the narratives above are indicated by x's for each quarter of the three-year SCOR

working group. Deliverables are italicized. Q1: Jan–Mar, Q2: Apr–Jun, Q3: Jul–Sept, Q4: Oct–Dec.

	2025				2026				2027			
Tasks	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Database and protocol development												
Identify and procure datasets for TOR 5 and D1	x	x	x	x	x	x	x	x	x	x	x	
Form database/protocol subcommittee		x	x									
Database structure development (TOR 5)			x	x	x	x	x	x				
Protocol development (TOR 2)			x	x	x	x	x	x				
Identify research priorities (TOR 3)						x		x				
Complete database population, share publicly (D1)												x
Write/publish original research article (D3)									x	x	x	x
Capacity building												
Form survey subcommittee		x	x									
Develop and circulate survey to seabird research community (TOR 1)			x	x	x							
Analyze and synthesize survey findings					x	x	x					
SCOR Visiting Scholar Program Application & Program					x	x	x	x				
Outreach to research teams in under-represented regions (TOR 4)		x	x	x	x	x	x	x	x	x	x	
Present survey findings and GISTS perspectives on capacity building at World							x					

Seabird Conference (D5)												
Write/publish short format article (D4)									x	x	x	
Meetings & Reports												
Virtual convening of WG**:** TORs and deliverables assigned to subcommittees, discuss protocol elements		x	x	x		x		x	x		x	
Hybrid convening of WG at World Seabird Conference (Hobart, Tasmania): focus on short-format article (D4), database (D1) and protocols (D2)							x					
Prepare and deliver annual report to SCOR				x				x				x

Capacity Building

Strategic planning for capacity building

A major priority of GISTS will be to identify the limiting and enabling conditions for seabird research, particularly the existence and continuation of long-term monitoring programs, in areas around the world that are currently under-represented in global analyses. Many of these under-represented areas occur in or in close proximity to the developing world (**Figure 2**). The lack of long-term ecological monitoring programs in developing countries has long been recognized and is not limited to marine systems. However, there has yet to be a focused study of the specific conditions that promote geographic disparities in seabird research and the mechanisms that can overcome them.

To address this need, GISTS will systematically examine contributing factors to geographic disparities in seabird research coverage. We will do this through dedicated expert discussions on the subject during working group meetings, and we will leverage knowledge of the broader seabird research community by conducting a survey to characterize the limiting and enabling conditions for seabird research in those regions (**TOR 1, D4 & 5**).

Following completion of our capacity-building survey efforts, we will synthesize our findings for publication in an article to be published in a peer reviewed journal (**D4**). Rather than publishing these findings and waiting for future groups to address established needs, we intend that GISTS members will leverage their positions, networks, skills, and other resources to engage in activities that meet the needs we identify (**TOR 4**). Of the work that has already been done to

characterize obstacles for related research endeavors (e.g., Barber et al. 2014 [marine biodiversity monitoring], Morrison et al. 2013 [multidisciplinary marine research]), inconsistent and inadequate funding is often cited as a key limitation. We anticipate that funding limitations will also be a key limiting factor identified in our survey (**TOR 1**) by representatives of research programs in under-represented regions. While establishing or funding new or ongoing monitoring programs is not within the purview of GISTS, we will seek to collaboratively identify short- and long-term activities that can clear the way for such programs by focusing on obstacles identified in the survey and through relationship building.

Working group member capacity-building activities will be showcased during virtual and hybrid working group meetings and through informal channels to build an invested learning community. We will synthesize survey results and working group perspectives on capacity building and share our findings with the broader community through a published paper (**D4**) and oral presentation at the World Seabird Conference (**D5**).

Information Sharing

Publicly available database

To understand biophysical mechanisms linking environmental change to top predator dynamics, seabird researchers use diverse methodologies to relate seabird data (i.e., breeding success, population size, movement patterns, etc.) to information about lower trophic levels (i.e., fish stocks, zooplankton and phytoplankton densities, etc.) and environmental drivers (i.e., *in situ*, modeled, or remotely sensed climatic and oceanographic fields). Consequently, seabird datasets are meaningfully linked to a wealth of information based on deep understandings of species and regional contexts. However, these linkages are often not well characterized beyond local research communities, hampering hemispheric and global-scale analyses. Uniting seabird colony datasets into a mult-dimensional, relational database will facilitate large-scale studies for a broader community of marine researchers (**TOR 5**). Moreover, making the database publicly available (**D1**) will promote equity in data accessibility as data sharing often occurs along lines of personal relationships among researchers that can (unintentionally) exclude newcomers to the field or those outside well-established research networks.

Publicly available protocols

Marine science capacity building reviews have identified training as a key obstacle to researcher participation and scientific program development. Beginning early in our working group plan, GISTS members will review methodological protocols at various stages of the data generation process (collection, summarization, refinement, and sharing). We will use this exercise to develop a collection of protocols which we will make publicly available as a compiled PDF on the Ocean Best Practices Repository. As protocols must be tailored to unique local conditions, circumstances, and resources, we will frame out protocol recommendations as “best practices”, which may be interpretable to diverse research contexts while still ensuring data comparability and reproducibility. Making standardized protocols publicly available promotes accessibility and

will presumably lead to their increasingly widespread use, hopefully allowing users to overcome some of the obstacles related to lack of training.

To build awareness of these resources, the Chair and Affiliate Chair will encourage and support GISTS members to apply for the SCOR Visiting Scholars Program. Currently, we aim to support the application of an ECOP and non-ECOP partner team to develop and carry out the Visiting Scholar Program during 2026 in one of the under-represented regions identified in **Figure 2.** Sharing best practices with marine researchers in this context will also allow GISTS members to review and revise protocol documents prior to the conclusion of the working group's official activities.

Capacity sharing

TOR 4 will have the GISTS working group to actively engage with seabird researchers from regions of the world that have typically been under-represented in global analyses (**Figure 2**). Our intent is that these activities (described above) will initiate and strengthen relationships between researchers around the world. These relationships will be reciprocal: rather than adopting a model in which knowledge is transferred from researchers in relatively well-represented regions of the world to those in under-represented regions, we anticipate that knowledge about best practices, capability development, and research directions will flow in both directions (capacity sharing as opposed to capacity building).

The proposed survey (**TOR 1**) will be a first step in capacity sharing among the seabird research community. Through the survey and its presentation as a published article and oral presentation at the World Seabird Conference (**D4 and D5**) we will synthesize obstacles to seabird monitoring as viewed by researchers from under-represented regions. Capacity-sharing activities will also extend to our objectives around data and methodological coordination. As previously discussed, it is not within the scope of the proposed working group to initiate or financially sustain seabird colony long-term monitoring programs, but by working with under-represented researchers we hope to identify creative pathways to leverage data when and when they are available. This could occur through novel application of statistical techniques that link sparse datasets to more consistent long-term time series. Increased collaboration between researchers may also help to identify commonalities among species and ecological contexts that could aid characterization of biophysical mechanisms underlying predator responses to climate change.

Early Career Ocean Professional Development

Eight ECOPs, representing five continents, will receive professional development opportunities through their involvement as full (four) or affiliate (four) members of GISTS. Opportunities will support ECOPs primarily in two ways: experience in international research coordination, and network development. Through working group deliberations, meetings, and deliverables, ECOP members will gain first-hand experience evaluating research needs on a global scale, setting high-level research priorities, and representing the global research community in communications products (**TORs 1–3 and 5**). ECOPs will also benefit from substantial network

development through engagement with other full and affiliate members of GISTS, as well as other researchers through conference attendance (**D5**) and capacity building/sharing activities. Network development is an essential element of early career development by facilitating new, and potentially lasting, research collaborations.

Working group activities will also support ECOP development beyond its immediate membership. GISTS members will engage with researchers in under-represented regions, including early career researchers, in fulfillment of **TOR4**. For example, we aim to apply for the SCOR Visiting Scholar program. Should this application be successful, this working group will aid in training early career scientists in best practices associated with data collection, summarization, refinement, and data sharing for investigations of seabird responses to environmental change.

Working Group Composition

Full Members (10)

Name	Gender	ECOP	Place of work	Primary research realm	Expertise relevant to the proposal
William Sydeman	M	No	Global	**Northeast Pacific**	Ecosystem,seabird, and fish ecologist; lead scientist for the Global Seabird Working Group; **California and Benguela upwelling ecosystems; Gulf of Alaska and Bering Sea ecosystems, global research focus**.
Motohiro Ito	M	**Yes**	Japan	**Northwest Pacific**	Seabird ecologist; climate effects on diets and distributions of seabirds at sea; **Japan Sea and Kuroshio/Western North ecosystems**
Enriqueta Velarde	F	No	Mexico	**Central Pacific**	Seabird and fish ecologist; interactions between seabirds, climate, and fisheries; seabirds as indicators; long-term monitoring; **subtropical and Gulf of California/Pacific ecosystems**
Tone Reiertsen	F	**Yes**	Norway	**Northern European Seas**	Seabird ecologist; predator-prey dynamics in ice-dominated systems; climate and fisheries effects; **Norwegian and Barents seas ecosystems**
Amanda Kuepfer	F	**Yes**	Falkland Islands	**Southwest Atlantic**	Seabird ecologist; long-term monitoring of penguins, albatrosses; impacts of fisheries bycatch; **sub-Antarctic to South Atlantic ecosystems.**
Heather Major	F	**Yes**	Canada	**Northwest Atlantic**	Seabird ecologist; climate effects on seabirds, seabird foraging and movement ecology; **Labrador Current ecosystem**

Christophe Barbraud	M	No	Global	**Southern Ocean**	Ecosystem and seabird ecologist; effects of climate and fisheries bycatch on albatrosses and penguins; **Indian Ocean, Humboldt Current upwelling ecosystem, tropical to sub-Antarctic ecosystems**
Matthieu Le Corre	M	No	Europe and Réunion Island	**Indian Ocean**	Seabird ecologist: effects of climate change on seabirds, physiological ecology, contaminants; **tropical Indian Ocean and Northwest Atlantic ecosystems**
Azwianewi Makhado	M	No	South Africa and Antarctica	**Southeast Atlantic**	Seabird ecologist; conservation biology of seabirds and seabird monitoring; fisheries effects on seabird food availability; **Benguela Current upwelling and Subantarctic ecosystems**
Francis Daunt	M	No	UK	**Northeast Atlantic**	Ecosystem and seabird ecologist; effects of climate change and fisheries on populations; **North Sea and NE Atlantic ecosystems**

Associate Members (10)

Name	Gender	ECOP	Place of work	Primary research realm	Expertise with seabirds relevant to the proposal
Helen Killeen	F	**Yes**	USA	**Northeast Pacific**	Marine ecologist with expertise in ecosystem research including seabirds. Experience co-leading international working groups and engaging early career researchers. Postdoctoral researcher for the Global Seabird Working Group.
Kyle Elliott	M	No	Canada	**Arctic (Atlantic and Pacific)**	Physiological ecology
Erpur Hansen	M	No	Iceland	**Arctic (Atlantic)**	Population ecology
Jonas Hentati-Sundberg	M	**Yes**	Sweden	**Baltic Sea**	Population ecology and oceanography
Chris Surman	M	No	Australia	**Southeast Indian**	Coastal tropical ecology
Philippa Agnew	F	**Yes**	New Zealand	**Southwest Pacific**	Population ecology
Heather Renner	F	No	USA	**North Pacific**	Conservation biology and population ecology
Richard Phillips	M	No	UK	**Southwest Atlantic**	Foraging and movement ecology
Megan Cimino	F	**Yes**	USA	**Southern**	Biological oceanography
Alexander Kitaysky	M	No	USA	**Northwest Pacific**	Physiological ecology

Working Group Contributions

William (Bill) Sydeman, Ph.D., is a seabird ecologist and the Chief Scientist at the Farallon Institute, a non-profit research organization. Bill will chair the WG and has extensive experience and expertise in multidisciplinary marine ecology focusing on seabirds, forage fish, zooplankton, and physical oceanography. Bill has published approximately 225 articles including in *Science Magazine*, and has supervised numerous interdisciplinary scientific groups and large projects around the world.

Motohiro Ito, Ph.D., is an ECOP Associate Professor at Toyo University in Japan. Motohiro will represent the western North Pacific on the WG. He has published on climate and seabird life history strategies in Japan and other Asian nations.

Enriqueta Velarde, Ph.D., is a Senior Scientist at Autonomous University in Mexico, and has studied seabird ecology in the Gulf of California and elsewhere in Latin America for the past 35 years. Enriqueta has published extensively on the combined effects of ENSO and fisheries on seabird breeding success and diet composition, and the use of seabirds as ecological indicators of marine ecosystem change.

Tone Reiertsen, Ph.D., is an ECOP researcher at the Norwegian Institute for Nature Research, specializing in Arctic and sub-Arctic seabird ecology who will represent northern Europe in the WG. Tone has published extensively on predator-prey dynamics of seabirds in the Barents and Norwegian seas.

Francis Daunt, Ph.D., is a Senior Scientist at the Center for Ecology and Hydrology in Scotland, and supervises one of the longest-running seabird programs in the world at the Isle of May in the North Sea. Francis has published extensively on climate change, fisheries, and seabirds in the Northeastern Atlantic.

Amanda Kuepfer, Ph.D., is an ECOP researcher at Falklands Conservation who leads the long-term Falkland Islands Seabird Monitoring Programme in the Southwest Atlantic. She has additional research experience studying albatross interactions with fisheries and participation in bycatch working groups.

Heather Major, Ph.D., is an ECOP and will represent the western North Atlantic. Heather is an Associate Professor at the University of New Brunswick, Canada, and has published on the population, foraging, and movement ecology of seabirds.

Christophe Barbraud, Ph.D., is a Senior Scientist with CNRS in France. Christophe has published extensively on seabird ecology in the Antarctic and sub-Antarctic realms of the southern Indian Ocean, focusing primarily on the effects of climate change on populations and phenology, as well as the effects of fisheries bycatch on seabird demography.

Matthieu Le Corre, Ph.D., is the Director of the Laboratory of Ecology and Marine Research and the Director of the Masters Biodiversity and Tropical Ecosystem Program of the University of La Réunion. He specializes in seabird ecology of tropical seabirds in the Indian Ocean. Matthieu has published extensively on tropical marine food webs, biodiversity hotspots, and bioindicators.

Azwianewi (Newi) Makhado, Ph.D., is an ECOP with the South African Department of Environmental Affairs. Newi studies seabirds in South Africa and the sub-Antarctic and has published on predator-prey dynamics and the effects of fisheries on penguins and other seabirds.

Relationship to Other SCOR Working Groups

Our proposed WG is similar in scope to Working group 125: Global Comparisons of Zooplankton Time Series. WG 125 used similar goals to synthesize available time series data, albeit for zooplankton, and conduct analyses to enhance scientific understanding of changes in zooplankton populations. We employ a similar design framework, in identifying and linking global seabird datasets to consolidate and understand both regional and unifying trends. As seabirds are top predators who directly or indirectly depend on the role of zooplankton in marine food webs, our goals and results are also likely to reflect the regional and temporal patterns characterized by WG 125. However, our proposed WG also differs from WG 125 in some strategic and forward-thinking ways. First and most importantly, we will emphasize network development and capacity building as a primary term of reference (TOR 2), both in terms of identifying new data streams, and in making these datasets more available to global marine ecological and seabird communities. Second, we will emphasize improving opportunities for ECOP, women, and scientists of color through targeted outreach to under-represented communities. Marine science has historically been poorly represented in terms of global participation and inclusivity, yet seabirds offer a valuable gateway to engage regions where the marine resources might not be scientifically integrated, but whose communities regularly observe seabirds in fishing, subsistence, or ecotourism contexts. Our proposal thus represents a valuable opportunity to build and support scientific partners and frameworks from diverse perspectives.

Key References

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Appendix

Working Group Member	**Relevant Publications**
William Sydeman	Sydeman et al. 2021 *Science* (DOI:10.1126/science.abf1772), Sydeman et al. 2015 *Science* (DOI:10.1126/science.aac9874), Sydeman et al. 2014 *Science* (DOI:10.1126/science.125163), Poloczanska et al. 2013 *Nature Climate Change* (DOI:10.1038/nclimate1685), Cury et al. 2011 *Science* (DOI:10.1126/science.1212928)
Motohiro Ito	Watanuki and Ito 2012 *Marine Ecology Progress Series* (DOI:10.3354/meps09627), Ito et al. 2009 *Marine Ecology Progress Series* (DOI:10.3354/meps08192), Watanuki et al. 2009 *Marine Ecology Progress Series* (DOI:10.3354/meps08264)
Enriqueta Velarde	Velarde et al. 2019 *Science* (DOI:10.1126/science.aaw9999), Velarde et al. 2013 *Scientific Reports* (DOI:10.1038/srep01332), Velarde et al. 2004 *Ecological Applications* (DOI:10.1890/02-5320)
Tone Kristen Reiertsen	Hodges et al. 2022 *Ecological Solutions and Evidence* (DOI:10.1002/2688-8319.12181), Reiertsen et al. 2021 *Marine Ecology Progress Series* (DOI:10.3354/meps13809), Hansen et al. 2021 *Global Change Biology* (DOI:10.1111/gcb.15665)
Francis Daunt	Burthe et al. 2016 *J Applied Ecology* (DOI:10.1111/1365-2664.12519), Daunt et al. 2005 *Behavioral Ecology and Sociobiology* (DOI:10.1007/s00265-005-0061-4), Frederiksen et al. 2004 *Global Change Biology* (DOI:10.1111/j.1529-8817.2003.00794.x)
Amanda Kuepfer	Ventura et al. 2023 *Biology Letters* (DOI:10.1098/rsbl.2022.0404), Kuepfer et al. 2022 *ICES J Marine Science* (DOI:10.1093/icesjms/fsac069), Kuepfer et al. 2022 *Biological Conservation* (DOI:10.1016/j.biocon.2022.109462)
Heather Major	Mallory et al. 2018 *Arctic Science* (DOI:10.1139/as-2017-0019), Bond et al. 2011 *Marine Ecology Progress Series* (DOI:10.3354/meps08975)
Christophe Barbraud	Jenouvrier et al. 2022 *Ecology Letters* (DOI:10.1111/ele.14076), Barbraud 2019 *J Animal Ecology* (DOI:10.1111/1365-2656.13026), Barbraud 2017 *Proceedings of the National Academy of Sciences of the USA* (DOI:10.1073/pnas.1718817114), Southwell et al. 2017 *Global Ecology and Conservation* (DOI:10.1016/j.gecco.2016.12.004)
Matthieu Le Corre	Trevail et al. 2023 *Current Biology* (DOI:10.1016/j.cub.2023.10.060), Lascelles et al. 2016 *Diversity*

	and Distributions (DOI:10.1111/ddi.12411), Le Corre et al. 2012 *Biological Conservation* (DOI:10.1016/j.biocon.2011.11.015)
Azwianewi Makhado	Makhado et al. 2021 *Birds – Challenges and Opportunities for Business, Conservation, and Research* (DOI:10.5772/intechopen.96326), Kainge et al. 2020 *Environmental Development* (DOI:10.1016/j.envdev.2020.100567), Sherley et al. 2020 *Ecology and Evolution* (DOI:10.1002/ece3.6554)