

Annual SCOR Working Group Report: 2025

WG 164: CoNCENSUS

1. Brief summary with the main highlights (200-300 words)

The 2024–2025 reporting period marked CoNCENSUS's transition from foundational analyses to implementation across all five Terms of Reference. Two workshops: De Hoop (South Africa, 7-11 October 2024; 26 participants from 10 countries) and IMCC (Cape Town, 14 October 2024; 48 participants); catalyzed progress by advancing data synthesis (ToR 1), refining best-practice tools (ToR 2), aligning data infrastructure with GOOS BioEco and OBIS (ToR 3), reviewing capacity-building (ToR 4), and strengthening the global community of practice (ToR 5).

The van Wyk et al. epistemic analysis provided evidence of geographic and methodological imbalances across seven decades of research. The Rolim et al. global dataset mapping quantified spatial coverage gaps across 392,000 samples from 53 countries and revealed disproportionate emphasis on developed nations and shallow tropical ecosystems. The van Wyk questionnaire (105 practitioners, 21 countries) identified that collaboration, capacity, and standardisation explained 70% of research practice variability, with half of respondents reported no network affiliation, underscoring urgent connectivity needs.

These analytical outcomes were integrated into practical outputs through the Framework for Knowledge Mobilisation (presented at Southern African Marine Science Symposium, September 2025), refined decision frameworks and maturity models validated through workshop testing, and the near-complete UNESCO OTGA training course (five modules ready for 2026 launch). Technical infrastructure advanced with GlobalArchive and Reef Life Survey Darwin Core cross-walks, enabling automated OBIS metadata ingestion. Student projects demonstrated capacity growth, with Schmid completing her Honours thesis on cross-method elasmobranch metrics (UTAS, 2025) and Memela advancing from Honours toward MSc on BRUV-DOV complementarity (Rhodes University).

CoNCENSUS contributed to GOOS Fish EOVS review through two expert meetings which enabled alignment between community practices and Essential Ocean Variable descriptors. Partnership discussions with The Fish Collective and the AfriBRUV network development (Kenya–Tanzania–Seychelles) strengthened coordination. Multiple manuscripts addressing indicator robustness, MPA effectiveness, and methodological influences on biodiversity assessment advanced toward publication, positioning the Working Group to deliver transformative contributions to global underwater fish observation research standardisation and interoperability.

2. Activities since previous report to SCOR (e.g., virtual or in-person meetings, email discussions, special sessions). Limit 1000 words

Major meetings and events:

- Towards the end of 2024 the WG held a large meeting (*De Hoop Workshop*; South Africa, 7–11 Oct 2024) with 26 participants from 10 countries that focussed on data-integration, indicator computation, and decision-tree refinement.
- In addition, the WG hosted an event at the International Marine Conservation Congress (Cape Town, 14 Oct 2024) with 48 participants. This workshop focused on strengthening community coordination (ToR 5), refining best-practice frameworks and maturity-model tools (ToR 2), aligning outputs with GOOS BioEco and OBIS standards (ToR 3), reviewing training and capacity-building initiatives (ToR 4), and identifying key methodological and regional research gaps to guide future engagement and data interoperability (ToRs 1 and 4).

Capacity development and ECR involvement:

- *Joanna Schmid* (Honours, UTAS): cross-method analysis of human-gravity effects on elasmobranch populations.
- *Sphume Memela* (MSc, Rhodes University): Best Practice Evaluation and Optimisation for multimethod surveys using baited remote and SCUBA video surveys; expanding on the African dataset collected by van Wyk.
- *Angus van Wyk* (PhD, Rhodes University): epistemic analysis, community of practice and BRUV vs DOV comparison across the Western Indian Ocean.
- Luther Adams (PhD, Rhodes University): Machine Vision applications for automating video processing, methodological decision tree, fisheries indicators and metrics.
- *Dr Kaylee Smit* (Post-doc, SAIAB): leading the AfriBRUV network through an NRF KIC project (Kenya–Tanzania–Seychelles) and co-developing indicator integration and OTGA materials.
- *Dr Fernanda Rolim* (Post-doc, Sao Paulo University): mapping of global fish-observation datasets to inform ToR 4 priorities for engagement and capacity development.

Collaborative outputs:

- CoNCENSUS contributed to the *GOOS Fish EOY review and spec-sheet* revision, integrating community feedback on sub-variables, observing approaches, and phenomena. This included two on-line expert co-development meetings.
- Preliminary engagement with OBIS is working to improve attribution and metadata challenges, particularly in searching datasets by sampling method, prompting schema improvements.
- Partnership discussions with *The Fish Collective* established alignment between CoNCENSUS indicators and emerging global biodiversity pipelines.
- AfriBRUV is working to establish collaborative research networks and build capacity for fish observation research in the Western Indian Ocean.
- OTGA Course Development: Three virtual workshops (March, June, September) advanced course content, evaluation materials, and video tutorials. Mazzuco (IODE Training Coordinator, UNESCO) led coordination with Smit, bringing five modules to near-completion readiness.
- Questionnaire and Framework: The global questionnaire achieved 105 responses from 21 countries, revealing three dominant community dimensions: collaboration, capacity, and standardisation. The resulting Framework for Knowledge Mobilisation was presented at the Southern African Marine Science Symposium (Cape Town, September 2025)

- Student Completions: Schmid completed Honours thesis (UTAS, June 2025) on cross-method elasmobranch metrics. Memela completed Honours and advanced toward MSc completion (Rhodes University) on BRUV-DOV complementarity. van Wyk continued progressing through his PhD, incorporating epistemic paper revisions, the global questionnaire and regional comparative data analyses. Adams continued PhD work on machine vision for automated video processing.
- External Engagement: Active participation in two GOOS Fish EOY expert meetings contributed to spec-sheet revisions. Partnership discussions with The Fish Collective established indicator alignment. Ongoing OBPS engagement prepared for framework submissions.

3. Documents published since previous report to SCOR (e.g., peer-reviewed journal articles, reports, Web pages) and should be limited to publications that resulted directly from WG activities and which acknowledge SCOR support

Published and Accepted:

1. Van Wyk, A., Bernard, A.T.F., Stuart-Smith, R.D., et al. (2025). Global epistemic analysis of underwater fish observation research: Seven decades of growth, collaboration, and geographic biases. *Fish and Fisheries*. (Accepted with revisions). Acknowledges SCOR WG 164 support.

Student Theses:

1. Schmid, J. (2025). Cross-method analysis of human-gravity effects on elasmobranch populations in marine protected areas. Honours thesis, Institute for Marine and Antarctic Studies, University of Tasmania, Australia.
2. Memela, S. (2024). Evaluating the efficacy of baited cameras and video transects for surveying tropical fish assemblages in the Western Indian Ocean. Honours thesis, Department of Ichthyology and Fisheries Science, Rhodes University, South Africa.

Reports and Presentations:

1. Smit, K.S., and CoNCENSUS Working Group. (2024). De Hoop Workshop Report: CoNCENSUS Working Group Meeting. De Hoop Nature Reserve, South Africa, 7-11 October 2024. 26 participants from 10 countries. Available on request.
2. Smit, K.S., and CoNCENSUS Working Group. (2024). IMCC Workshop Report: Best Practices and Knowledge Mobilisation in Underwater Fish Observation Research. International Marine Conservation Congress, Cape Town, South Africa, 14 October 2024. 48 participants.
3. van Wyk, A., Bernard, A.T.F. (2025). Framework for Knowledge Mobilisation in underwater fish observation research. Oral presentation, Southern African Marine Science Symposium, Cape Town, South Africa, September 2025.

Manuscripts in Preparation (acknowledging SCOR WG 164 support):

1. Rolim, F., et al. (in prep). Global patterns and geographic biases in underwater fish observation datasets: Implications for marine biodiversity monitoring across euphotic, mesophotic, and aphotic zones. Target journal: *Global Ecology and Biogeography*.

2. Goetze, J., et al. (in prep). Cross-method comparison of transect-based underwater fish observation techniques: Evaluating indicator interoperability across visual census, diver-operated video, and remotely operated vehicles. Target journal: *Methods in Ecology and Evolution*.
3. Bernard, A.T.F., Stuart-Smith, R.D., et al. (in prep). Decision framework for underwater fish observation method selection: A trait-based roadmap for diverse monitoring contexts and research objectives. Target journal: *Frontiers in Marine Science / Ocean Best Practices*.

Additional manuscripts from ToR 1 comparative analyses are in active development, addressing: (1) global robustness of reef fish and elasmobranch assemblage indicators across census methods, (2) cross-method evaluation of marine protected area effectiveness indicators, and (3) methodological influences on characterizing fish biodiversity responses to global change drivers.

4. Progress toward achieving group's terms of reference. List each term of reference separately and describe progress on each one. Limit 1000 words

During 2024–2025, CoNCENSUS advanced all five Terms of Reference through data synthesis, analytical development, and knowledge-mobilisation. Focus shifted from data gathering toward integration and outputs, strengthening the empirical base for methodological comparability, refining best-practice frameworks, and building infrastructure for interoperability. Progress was achieved through analyses, workshops, student projects, and collaboration with GOOS BioEco, OBIS, and Ocean Best Practices.

ToR 1: Methodological comparison and essential ocean variables

Substantial progress established a global analytical baseline. The Rolim et al. study (draft manuscript) analysed the CoNCENSUS dataset of 392,000 fish-observation sampling points from 53 countries, plus additional OBIS and GBIF datasets. This provides the first global view of sampling bias among light zones, habitats, methods, and country development status. Analyses confirmed strong concentration of effort in developed nations and shallow tropical ecosystems, with limited coverage in developing nations and deeper mesophotic and aphotic zones. The study revealed many OBIS and GBIF datasets with poorly documented sampling methodologies—a critical gap if these repositories are used for GOOS EOY calculations.

Complementary studies addressed methodological performance. The Goetze et al. (draft) transect-method comparison investigated indicator interoperability across visual census, diver-operated video, and remotely operated vehicles. Post-graduate projects (van Wyk PhD; Memela MSc) examined complementarity and trade-offs between baited remote underwater video and diver-operated video in the Western Indian Ocean. Schmid's 2025 Honours thesis explored indicator sensitivity to human-pressure gradients, providing initial support for alignment between elasmobranch metrics from underwater visual census and BRUVs. Together, these projects provide empirical evidence on methodological and geographic biases, building the analytical foundation for forthcoming manuscripts on indicator robustness, MPA effectiveness, and biodiversity assessment methods.

ToR 2: Best Practices and community guidelines

The De Hoop (October 2024) and IMCC 2025 workshops consolidated ToR 2 outputs. Participants refined the decision-tree and "maturity-model" framework assessing observation method readiness for various monitoring contexts. Discussions incorporated ToR 1 empirical findings to calibrate scoring criteria. The 2025 global questionnaire (105 practitioners, 21 countries) revealed widespread adherence to standard operating procedures but persistent variability in implementation and unequal technology access, confirming the maturity-model's relevance and highlighting needs for method-change guidance in long-term monitoring. The draft roadmap is being aligned with OBPS templates and GOOS BioEco standards.

Additional best-practice initiatives include the stereo-ROV BPG (draft manuscript), deep-sea stereo-BRUVs optimization work (K Smit, A Eddy), and automated video processing using machine vision (Adams), which addresses perceived BRUVs biases for fisheries surveys.

ToR 3: Data management policy, workflows and infrastructure

Work moved from conceptual design to operational testing. The GlobalArchive-to-Darwin Core cross-walk was completed and validated, providing clear mapping of field-level metadata to international standards. This supports automatic stereo-video metadata ingestion into OBIS and aligns with GOOS Fish EOVS reporting requirements. Similar cross-walks were completed for Reef Life Survey data. The De Hoop meeting endorsed these developments and recommended further pilot tests. While full automation remains a future goal, the technical foundation for FAIR-compliant data exchange between regional archives and global biodiversity databases is now established. The new Mobi-Fish database will pilot this data schema integration.

WG members contributed to developing and reviewing the new GOOS Fish EOVS Specification sheet, ensuring consistency between observation practices, indicators, and EOVS descriptors for sampling effort, methodological metadata, and spatial coverage. Following Rolim et al. findings, discussions with OBIS and GOOS began regarding minimum metadata requirements for data providers.

ToR 4: Determine priority areas for engagement, capacity development and research

Activities strengthened the evidence base for identifying global priorities. The van Wyk et al. epistemic analysis (accepted 2025) provided the first seven-decade global review, highlighting needs for broader methodological and geographic inclusion. The Rolim et al. global dataset mapping confirmed heavy emphasis on euphotic-shelf habitats and scarcity of mesophotic, aphotic, and deep-reef data, defining priority areas where capacity building, non-diver methods (BRUVs, ROVs), and improved metadata collection could expand global coverage. The van Wyk global questionnaire revealed large disparities in collaboration, equipment access, and standard operating procedure consistency, providing data-driven rationale for targeting under-sampled regions and promoting standardisation.

The near-complete OTGA training modules, De Hoop and IMCC workshops, and draft Framework for Knowledge Mobilisation integrate these analytical outputs into practical strategies for improving global coordination, capacity, and data interoperability.

ToR 5: Build and sustain a global community of practice

The 2025 global questionnaire delivered the first quantitative assessment of the international underwater fish-observation research community. Responses from 105 participants across 21

countries revealed three dominant dimensions—collaboration, capacity, and standardisation—explaining nearly 70% of community variability. Half of respondents reported no network affiliation, underscoring needs for connectivity mechanisms and equitable participation. The Framework for Knowledge Mobilisation, presented at the Southern African Marine Science Symposium 2025, outlines practical actions under these three pillars and supports designing a formal community-of-practice structure linking practitioners through the OTGA platform and complementary global initiatives (OBIS, OBPS, GOOS BioEco). Planned 2026 work includes a second survey phase and developing a governance model for post-WG continuity.

Capacity development

The UNESCO OTGA Underwater Fish Observation Research course reached advanced development. Five modules (stereo-BRUVs, ROVs, Reef Life Survey, REEF citizen-science, introductory) have nearly complete content with video tutorials, diagrams, and interactive lessons. Although evaluation components and introductory module require completion, bulk material is ready for 2026 release. This represents a major collaborative output serving as an enduring capacity-development resource. The NRF KIC mobility grant (K Smit) supports GOOS BioEco partner exchange. Student projects (Memela, Schmid, Honours internships) demonstrate capacity growth and regional framework application. De Hoop and IMCC training sessions expanded methodological literacy and inclusion. Additional training was provided to researchers from South Africa, Seychelles, Trinidad and Tobago, and Cape Verde.

Overview

Progress during 2024–2025 consolidated through coordination among task leads and partner organisations, demonstrating coherent advancement from initial data collation toward practical implementation. Although course finalisation and automated data-integration testing continue into 2026, the Working Group now has mature evidence bases, operational frameworks, and expanding community capacity to deliver remaining objectives, positioning CoNCENSUS for lasting contributions to standardisation and interoperability of global underwater fish-observation research.

5. WG activities planned for the coming year. Limit 500 words

The final phase of CoNCENSUS will focus on publishing core outputs, operationalizing technical infrastructure, and ensuring long-term sustainability of the global community of practice. Activities are organized to complete all five Terms of Reference:

ToR 1 - Methodological Comparison: Priority focus on publishing the three planned core manuscripts addressing (1) global indicator robustness across census methods, (2) cross-method evaluation of MPA effectiveness indicators, and (3) methodological influences on biodiversity assessment. These analyses will utilize the compiled 392,000-sample dataset and represent the primary empirical deliverables of the Working Group. The Rolim et al. global dataset mapping paper and van Wyk-led BRUV-DOV comparison studies will also be finalized for submission in 2026.

ToR 2 - Best Practices: The decision framework and maturity model will be field-tested with 3 to 5 partner monitoring networks (including RLS, BRUVS Global, and regional programs) to refine scoring criteria and document practical applications. Following field validation, complete frameworks will be

packaged for submission to the Ocean Best Practices System and for endorsement by GOOS BioEco as recommended practices for Fish EOY monitoring. The stereo-ROV best practice guidelines and method-change guidance for long-term monitoring will be finalized for publication.

ToR 3 - Data Management: Automated data pipelines from GlobalArchive and RLS to OBIS will be tested at scale and operationalized, with the Mobi-Fish database serving as a pilot implementation case. All cross-walk scripts, validation tools, and documentation will be published via Github and OBPS, accompanied by user guidance documents for data providers. Ongoing collaboration with OBIS will implement improved metadata standards based on findings from the Rolim global dataset analysis, particularly enabling method-searchable fields. We will look into the development of a webinar series to train data providers on using the new pipelines.

ToR 4 - Capacity Development: The UNESCO Ocean Teacher Global Academy course on Underwater Fish Observation Research will be completed and launched in 2026, establishing a long-term training platform. The van Wyk community questionnaire findings will be published alongside the Framework for Knowledge Mobilisation, and a synthesis paper integrating the epistemic analysis, global dataset mapping, and questionnaire results will provide strategic guidance on priority regions for capacity building, methodological priorities (deep-sea, mesophotic habitats, developing nations), and future research directions. Regional training initiatives will leverage the OTGA course and target under-sampled areas identified through these analyses.

ToR 5 - Community of Practice: A priority step is to draft a governance structure, defining organizational models, institutional partnerships, and leadership mechanisms to ensure post-WG sustainability. The Working Group will formalize integration with GOOS BioEco (Fish EOY team) and OBIS, defining clear roles and data-sharing protocols. We will look to develop a dedicated community platform linking to the OTGA course, best practices repository, and member collaboration tools. A sustainability plan documenting funding mechanisms, minimum standards, and knowledge-transfer protocols will guide long-term operations.

6. Is the group having difficulties expected in achieving terms of reference or meeting original time schedule? If so, why, and what is being done to address the difficulties Limit 200 words

Member time availability has remained challenging throughout the project, as noted in previous reports. However, the 2024-2025 period represented a strategic shift from data collection to analytical synthesis, requiring extended coordination across multiple institutions and datasets. The dedicated postdoctoral positions secured in 2023 have substantially improved our capacity.

We are confident that 2026 will see completion of all core deliverables for three key reasons: (1) foundational data compilation and framework development are now complete, shifting work to more manageable publication and implementation tasks; (2) dedicated research support is in place through postdoctoral fellows and the AfriBRUV network; and (3) we have implemented quarterly milestone reviews with clear accountability mechanisms.

To ensure successful completion, we are prioritizing core manuscripts (ToR 1 comparative analyses and synthesis papers), OBPS submissions (ToR 2), and tool publication (ToR 3) over supplementary outputs. If possible we would like to schedule an intensive in-person manuscript workshop for April-

May 2026 to drive these publications forward, and established monthly coordination meetings for each ToR task team.

7. Any special comments or requests to SCOR. Limit 100 words.

We request a final one-year extension to end-December 2026 to complete publication and implementation of our outputs. The Working Group has matured from a planning to a delivery phase, with analytical frameworks now tested, datasets compiled, and community engaged. Dedicated support mechanisms are in place to ensure timely completion. We commit to quarterly progress reporting to SCOR and will implement a formal mid-year review (June 2026) to assess trajectory and adjust scope if needed to ensure completion of core Terms of Reference by year-end.

Additional information can be submitted and may be posted at the SCOR Annual Meeting webpage at the discretion of the SCOR Executive Committee Reporter for the WG and the SCOR Secretariat.