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South-western Indian Ocean Cetacean network for research and conservation (INDOCET)

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1. Background and general objectives

The Indian Ocean Cetacean Network (IndoCet) Consortium is dedicated the research and conservation of all cetacean species that occur across the south-western Indian Ocean (SWIO). The general aim of the network is to improve knowledge on and promote conservation of cetaceans in the SWIO. Initiated in 2014 and officially launched in 2017, IndoCet does not have formal legal status but rather works as a network of individual researchers and/or people actively involved in cetacean conservation in the SWIO. The network currently comprises 40 members, all of whom are actively involved in cetacean research in seven countries of the region (Kenya, Tanzania, Mozambique, South-Africa, Madagascar, Reunion/Mayotte, Mauritius) as well as ten associate members. The structure and operating rules of the Consortium are described in a Memorandum of Understanding (MoU), agreed upon by the members, to ensure that all members are guided by the same goals and wish to work together under a common understanding (revised in Oct.2022).

The primary goals of the network are to:

1. Advance understanding of the biology of cetaceans that occur in the SWIO, and more specifically to:
   - Foster research on the biology of cetaceans in the SWIO
   - Promote exchanges of expertise
   - Facilitate/encourage publication of peer-reviewed papers
   - Develop online platforms for reporting information/archiving/data exchange
2. Foster collaboration between research groups
   - Collating existing dataset and sharing metadata
   - Facilitate sharing of data, experience and tools
   - Facilitate prioritization and development of future common research projects
3. Develop capacity in SWIO range states for cetacean research and conservation, though workshop, conferences, training internship, staff exchange, ect…
4. Promote conservation of cetaceans and mitigation of anthropogenic impacts in the SWIO
5. Facilitate communication regarding research activities:
   a. Within the consortium, among members

b. As a common voice on cetacean conservation, research and management across the SWIO

6. Promote internationally recognized guidelines of research ethics and professional conduct.

Several activities have been implemented since the creation of the network, which are described below.

1. Fostering collaboration through workshops and meetings

The IndoCet Consortium has managed to meet in person five times over the last eight years since 2014 (2015 in Madagascar, 2017 in Reunion, 2019 in Reunion and Barcelona and 2022 in South-Africa). These meetings were funded as part of regional programs, including Et.Cet.R.A[1]., COMBAVA[2], led by Globice, the Quieter Western Indian Ocean Project (QWIO), led by the Wildlife Conservation Society (WCS), MiMUNOPS (Mise en valeur et MUtualisation des connaissances de la biodiversité marine et terrestre lndian Océanique, Patrimoine à Sauvegarder), led by the University of Reunion, and in conjunction with Scientific conferences such as the Humpback Whale World Conference, conferences of the Marine Mammal Society, the Island Biology Conference and the WIOMSA (Western Indian Ocean Marine Science Association) Scientific Symposium. The reports of these meetings are available online on the IndoCet Website.

2. Network communication

Creation of the IndoCet website was funded by the Indian Ocean Commission in 2015. Since then, the maintenance and further developments of the website have been undertaken and funded by grants from the European Union. The IndoCet website allows IndoCet members to have their own user account and login through which they can share and access information, including metadata for regional projects, publications and report strandings (see section below).

An IndoCet newsletter has also been established for members to share information about current and future project being developed in the region. Newsletters are also available to download on the IndoCet website and the articles also inform the News section of the website. A WhatsApp group and a mailing list is used to share instant news, while a Facebook page has been created for external communication. A dedicated WhatsApp group, that extend to a larger community is used to provide guidance for stranding response and species identification and to quickly and effectively share information on stranding events occurring in the region. In many areas with poor internet coverage, WhatsApp has proven to be a very effective and accessible means of communication for people in the consortium.

3. Network activities/Data collation/database

The IndoCet website is intended to be an interactive platform and a source of information for the IndoCet members, and more broadly for the scientific community. The ambition is to further develop the website to make it a living and actively used repository that allows centralization and visualization of the cetacean data available from the region.

- **Publications depository**

The IndoCet interactive website aims to centralize cetacean publications from the region in order to increase their accessibility to all members. To date, 77 publications have been up-loaded, most of them peer-reviewed but also IWC papers and other reports. IndoCet members can have direct access to papers when logged in to their account, whereas the general public can only see the list of publications and the link to journals.

[1] https://www.globice.org/campagne/programme-et-cet-r-a/
[2] https://www.globice.org/campagne/programme-combava/

- **Metadata**

The IndoCet website centralizes information on existing datasets (metadata), including satellite tracking; photo-ID; biopsy; acoustics etc. The intention is to visualize this data into interactive maps (for example visualizing the locations of static acoustic recorders deployed across the region, with a filter for year).

- **Stranding data**

Stranding events reported between 2000-2020 from the region have been compiled and analyzed, and consist of 1,258 individual animals to date, with 17 genera and 28 species This work has led to a publication submitted to the Journal of Cetacean Research and Management and is currently in review (Plön et al. In Review)

In order to facilitate the collation of strandings data from 2020 into the future, the IndoCet website includes a **"**Report a stranding" page. This provides a way to report and centralize information on stranding events, and IndoCet members are encouraged to report strandings data in an online table. Data collected includes the stranding location, the people to contact, the species concerned and other relevant information. An interactive map allows visualization of the locations of regional strandings, with an option to filter the data by family. The map is created using Google Maps, which limits the number of layers to 10, so strandings are currently grouped by family and not by species. This map does not currently update automatically and is updated once a year. It may be improved in the near future, with the use of the SIMM-OI portal (Systeme d'Information Milieu Marin Océans Indien et Austral), implemented by Ifremer.

The "stranding network" page includes a link to a resources page, providing links to existing protocols for responding to both dead and live animals. A hands-on manual that provides basic guidance and instructions for sampling is available on the Stranding page of the IndoCet website (see Plön et al., 2015, Supp. Mat.). These are publications from different sources, and it has been proposed that a simplified standardized spreadsheet and protocol to collect samples (tissue, teeth…) on stranded animals also be made available.

IWC disentanglements training workshop were held in Kenya in 2019 and are planned in Reunion and Mayotte in June 2023.

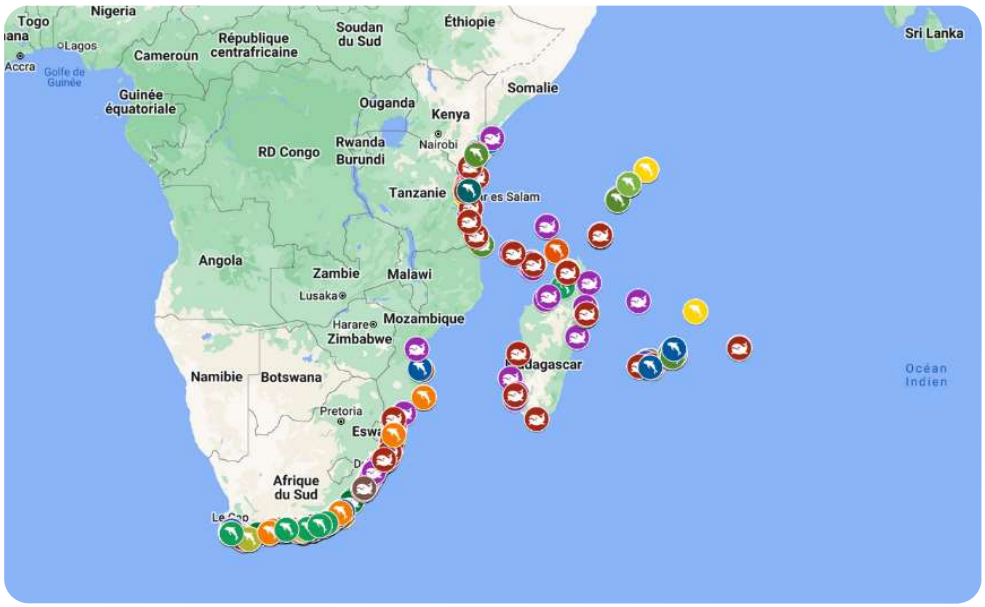

Figure 1. Interactive map showing stranding data collate in the SWIO in 2000-2020 on (from Ploen et al., in review), available on the IndoCet website.

- **Large scale surveys**

Several researchers and institutions from the region have been developing partnerships with platforms of opportunity. This includes taking part in research surveys as MMOs on board large oceanographic vessels transiting the WIO. Other engagements are also in development as part of the QWIO project. These data have been centralized into a GIS database, which currently includes:

- RESILIENCE [3] (fRont Ronts, EddieS and marIne LIfe in the wEstern iNdian oCEan) oceanographic survey (South Africa-Reunion), on board the research vessel *Marion Dufresne*, with MMOs from Nelson Mandela University and Globice;
- Monaco IO Expedition (Seychelles-Saya de Malha-Mauritius), onboard the oceanographic vessel *SA Agulhas II*, with one MMO from Globice;
- 8 surveys on-board the French patrol vessel *Osiris II* (Eparses Islands, Mauritius, Seychelles, Tanzania, Comoros, Madagascar, St Paul & Amsterdam), with MMO from MMCO (Mauritius), Watamu Marine Association (Kenya), Cetamada (Madagascar), CetaMaore (Mayotte) and Globice (Reunion).

The ambition is to further develop a network of MMOs to survey the SWIO using platforms of opportunity and to build up a long-term data repository. Several surveys have been identified and data owners have been approached to include this data as part of this regional initiative. The SIMM-OI portal will be used to create interactive maps of these data on the IndoCet website. It is hoped that data from the large-scale REMMOA[4] (REcensement des Mammifères marins et autre Mégafaune pélagique par Observation Aérienne) aerial survey will also be made available through this portal, in partnership with Pelagos Laboratory/University of La Rochelle/ French Biodiversity Agency (OFB).

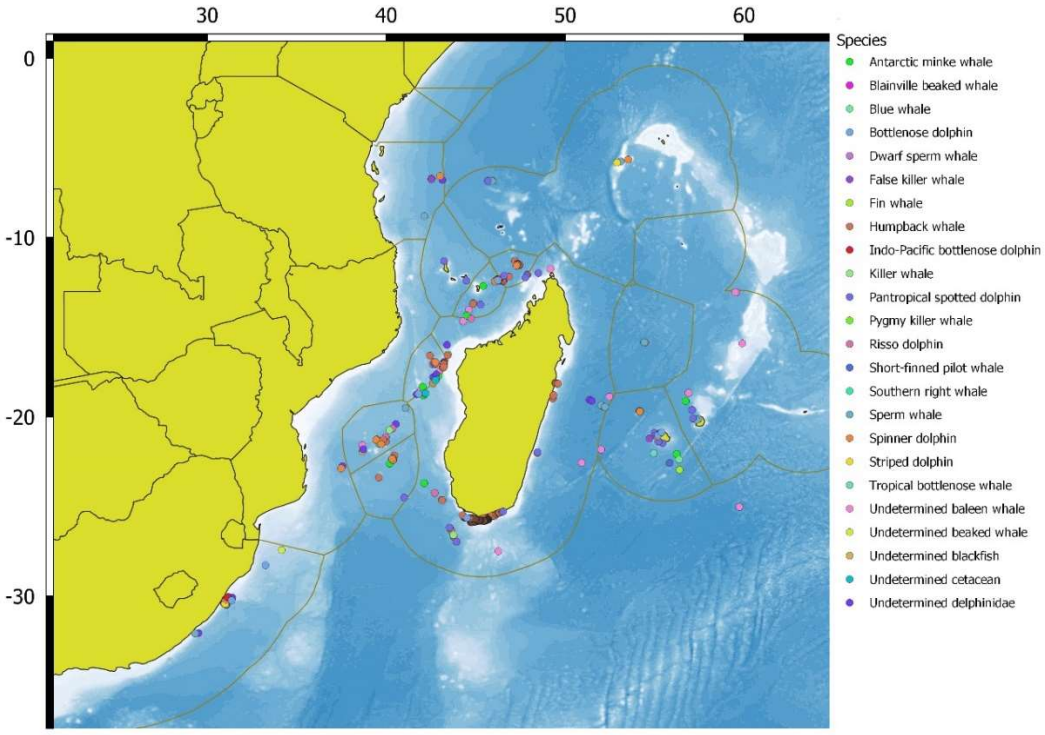

Figure 2. Map showing cetacean sightings collected by Marine Mammal Observers on-board platforms of opportunity in 2021-2022 and centralized into an IndoCet GIS database (RESILIENCE survey, OSIRIS surveys, Monaco Expedition WIO).

[3] https://indocet.org/en/resilience/
[4] https://www.observatoire-pelagis.cnrs.fr/pelagis/programmes/remmoa/?lang=en

- **Tagging data**

A tagging workshop held in Reunion in 2014 provided the original impetus for the creation of IndoCet and remains one of the consortiums focal activities. Humpback whale tagging datasets from the SWIO have been collated and an animation of their combined movements is currently available on the IndoCet website. The intention is to create an interactive map where users can select particular tracks in order to see additional information about the owners of the dataset and other metadata. Ideally a DOI will also be provided, so that the data can be appropriately referenced. This would allow existing and new tracking data from the region to be visualized on a single platform.

- **Photo-identification platform**

IndoCet has worked in close collaboration for more than 6 years with WildMe to create a customised Flukebook platform for Indocet, in order to facilitate data sharing among members and to develop features specific to the data-management needs of the consortium. Improvements have been made to customize the platform to the needs of the researchers from the region. The development of these features was a long process and the to date data imported into Flukebook are from Cetamada (1576 encounters), Megatera (951 encounters) and Globice (2651 encounters). However, matching has not yet been undertaken as the platform is designed to be a complete database and not just a matching platform, and additional issues with functionality and matching processing time still remain to be resolved.

Scientists and organization from the region are also providing data to HappyWhale.

Several IndoCet memebers are exploring ways that humpback whale tail flukes can be matched using HappyWhale in a collaborative and coordinated way within the framework of the network. Available data extend to a few thousand identified individuals in several datasets, most of which has already been accessioned into privately held databases.

- **Regional programs**

Several collaborative initiatives have been conducted in the SWIO region. These regional research programs are not led by IndoCet but are based on partnerships and contributions among several IndoCet members and their institutions. These have included:

- COMBAVA (COoperation régionale pour l'étude des Mouvements des Baleines à bosse et VAlorsation des résultats): led by GLOBICE in collaboration with Salvatore Cerchio (AACF), with the contribution of several partners from the region (Cetamada, IHSM, Watamu Marine Association, Zavora Marine Lab, Shanan Atkins, Gill Braulik, Parc Naturel Marin de Mayotte, Marine Discovery Center, WCS). The project aims to assess temporal distribution and humpback whale song structure and provide insights into population structure and connectivity in the region. Autonomous recorders were deployed at several breeding sites, including Réunion Island, Madagascar, Tanzania, Kenya, Mozambique, South Africa, Mayotte, Mauritius and Western Australia during the austral winters 2016-2022.
- QWIO (Quieter Western Indian Ocean): led by WCS and funded principally by FFEM (Fond Français pour l'Environnement Mondial). The project aims to carry out a scientific assessment of underwater radiated noise generated by shipping and its effects on a suite of focal species, including large cetaceans, whale sharks and sea turtles in the Western Indian Ocean.
- Indian Ocean Humpback Dolphin Consortium (IOHDC): a dedicated consortium for the protection of the Indian Ocean humpback dolphin (*Sousa plumbea*) has been created by several researchers and institutions from the western Indian Ocean. The primary goal of the consortium is to coordinate and galvanize action to improve the conservation of the species throughout its range, and thus this effort will extend beyond the boundaries of IndoCet.