

Report of the

**FAO Workshop on Sea Cucumber Fisheries: An Ecosystem Approach
to Management in the Indian Ocean (SCEAM Indian Ocean)**

Mazizini, Zanzibar, the United Republic of Tanzania, 12–16 November 2012



CHEMISTRY RESEARCH AND APPLICATIONS

HANDBOOK OF IONIC LIQUIDS

PROPERTIES, APPLICATIONS
AND HAZARDS



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Cover photograph: A live specimen *Bohadschia atra*, Chumbe Island, Zanzibar, the United Republic of Tanzania (courtesy of Dr Steven Purcell).

PREPARATION OF THIS DOCUMENT

This report describes the activities and outputs of the workshop entitled “Sea Cucumber Fisheries: An Ecosystem Approach to Management in the Indian Ocean (SCEAM Indian Ocean)”, which was held in Mazizini, Zanzibar, the United Republic of Tanzania, 12–16 November 2012.

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ABSTRACT

The livelihood opportunity that sea cucumber fisheries provide to many coastal fishers in the Indian Ocean is threatened by widespread overfishing. The five-day SCEAM Indian Ocean workshop was held in November 2012 and brought together fishery managers from 14 countries to provide a forum for sharing knowledge and improving management plans in Indian Ocean sea cucumber fisheries. It followed the format of a similar workshop that was held in the Pacific in 2011. Workshop facilitators first presented background seminars on up-to-date research on fisheries management. The workshop then focused on interactive sessions with workgroup exercises and plenary discussions that helped participants diagnose their fisheries before deciding on appropriate objectives, regulatory measures and management actions. A field day was also included in the agenda to provide hands-on experience in species identification and product processing. The workshop outputs given in this report detail current management practices and constraints in Indian Ocean sea cucumber fisheries and the proposed strategies and research priorities of the participating fishery managers.

RÉSUMÉ

Les pêcheries d'holothuries qui fournissent des revenus substantiels à de nombreux pêcheurs de l'océan Indien sont largement surexploitées. Le groupe de travail de cinq jours, SCEAM océan Indien, a rassemblé des gestionnaires de 14 pays pour partager les connaissances et améliorer les plans de gestion de ces pêcheries dans l'océan Indien. Il a suivi une organisation similaire à celle utilisée pour le groupe de travail océan Pacifique en 2011. Les organisateurs ont d'abord présenté des séminaires de synthèse sur l'état des recherches et la gestion des pêches. Par la suite, le travail a comporté des sessions interactives avec des exercices en groupes, suivis de discussions plénières qui ont aidé les participants dans le diagnostic de l'état de leur pêcherie, avant de décider des objectifs appropriés, des mesures de régulation et des actions de gestion. Une journée de terrain programmée pendant le groupe de travail a permis un apprentissage de l'identification des espèces et des méthodes de traitement des produits. Les résultats du groupe de travail, présentés dans ce rapport, détaillent les conditions actuelles de gestion des pêcheries d'holothuries, et ses contraintes dans l'océan Indien, ainsi que les stratégies proposées et les priorités de recherche pour les gestionnaires qui ont participé à l'atelier.

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The workshop was organized by the Western Indian Ocean Marine Science Association (WIOMSA) and FAO under the FAO/EU SmartFish project of the Indian Ocean Commission. The generous funding support from the Australian Centre for International Research (ACIAR) to cover travel costs for some participants and operating costs of the workshop is gratefully appreciated. Grateful thanks are also given to the Sultanate of Oman, which contributed funds for the workshop operating costs through the Fishery Support Unit within the Indian Ocean Rim Association for Regional Cooperation (IOR-ARC). Thanks are also due to Lilian Omolo and Salum Hamed at WIOMSA for handling the administration of the workshop.

H. Eriksson is grateful to the Department of Ecology, Environment and Plant Sciences at Stockholm University, Sweden, for its support during the planning, organization and reporting of the workshop. S.W. Purcell thanks Southern Cross University and its National Marine Science Centre, Australia, for administrative support to enable the co-organization and co-facilitation of the workshop.

ABBREVIATIONS AND ACRONYMS

ACIAR	Australian Centre for International Agricultural Research
ASCAM	Advances in Sea Cucumber Aquaculture and Management
BDM	bêche-de-mer
BMU	beach management unit
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPUE	catch per unit effort
EAF	Ecosystem approach to fisheries
EIO	Eastern Indian Ocean
FAO	Food and Agriculture Organization of the United Nations
FRP	fibreglass reinforced plastic
GPS	Global Positioning System
HDI	human development index
IHSM	Institute of Fisheries and Marine Sciences (Madagascar)
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated (fishing)
KCDP	Kenya Coastal Development Project
MAC	management advisory committee
MASMA	Marine Science for Management
MFW	Minister of Fish Wealth (Yemen)
MPA	marine protected area
MPRH	Ministry of Fishery and Marine Resources (Madagascar)
MSY	maximum sustainable yield
NARA	National Aquatic Resources Research and Development Agency (Sri Lanka)
NCFC	National Coastal Fisheries Corporation (Yemen)
NGO	non-governmental organization
ONET	Organisation des Exportateurs de Trepangs (Madagascar)
SCEAM	Sea Cucumber Fisheries: an Ecosystem Approach to Management
SPC	Secretariat of the Pacific Community
SWIOFC	Southwest Indian Ocean Fisheries Commission
TAC	total allowable catch
TSZ	Tanzanian shilling
TURF	territorial use rights in fisheries
UVC	underwater visual census
WIO	Western Indian Ocean
WIOMSA	Western Indian Ocean Marine Science Association

EXECUTIVE SUMMARY

Across the Indian Ocean, sea cucumber fisheries that serve the Asian dried seafood market are showing signs of significant decline by unsustainable exploitation rates. This situation is worrying because sea cucumbers provide a substantial opportunity for income to people and countries in the region. This undesirable situation can, at least partly, be attributed to insufficient management. To assist sea cucumber fisheries managers in decision-making, the Australian Centre for International Agricultural Research (ACIAR) and FAO have developed pragmatic manuals. The ACIAR manual provides a “managers toolbox” by outlining six indicators that assist in identifying the status of a fishery, and the FAO manual provides a “roadmap” for decision-making about management measures. While these manuals have been widely distributed throughout the tropical world, it was identified that a more hands-on approach was needed to guide managers through the implementation of these manuals. This need was met through the development of a workshop series called “Sea Cucumber Fisheries: an Ecosystem Approach to Management (SCEAM)”. The first workshop focussed on Pacific sea cucumber fisheries and was held in Fiji Islands in 2011. This document reports the SCEAM Indian Ocean workshop, held in Zanzibar, the United Republic of Tanzania, in November 2012. Workshop participants were identified and selected on the principle that they had to be managers or senior officers with an intimate knowledge of the fishery in their country. Other criteria were that they could actively contribute to the workshop and be able to influence management change in their fishery following the workshop. Eighteen participants from 16 countries were invited. Fifteen participants from 13 countries attended the meeting owing to three last-minute cancellations.

Prior to the workshop, all participants submitted a data form about their fishery. The information from these forms revealed, among other things, the diversity of fishery operations targeting sea cucumbers in the region and how there are different management needs and capacities in the countries. During the workshop, participants were initially presented introductory seminars on up-to-date research and the ecosystem approach to management in sea cucumber fisheries. The workshop then built on interactive sessions of group discussions and exercises to facilitate learning. After being guided through the ACIAR “toolbox” in a seminar, the participants worked in groups to review the six indicators in the manual to assign a status to their fishery. In this exercise, ten fisheries were classed as overfished or depleted. Only two fisheries were moderately exploited or better. Based on the status that was defined for the fishery, the participants were then guided through the FAO “roadmap” and, in workgroups, decided what regulatory measures and management actions are appropriate for their fishery based on the assigned status. In these exercises, emphasis was placed on the importance of interpreting the manuals in the context of the fishery operations and institutional system in their country. The manuals do not give definitive answers to the problems, but help guide the manager through decision-making. In an exercise to define management objectives, the highest-ranked management objective among the participants was to “maintain/restore abundances of sea cucumbers for future generations”.

Plenaries and discussions following the workgroups were an important component of the workshop process. Here, barriers or management challenges identified by participants were discussed. During the final plenary session, key priority research areas to aid management, and training needs to facilitate monitoring and enforcement of regulations, were identified. The regional/subregional movements (fishers and trade) were frequently stated as a challenge that undermined national management, and governance structures that facilitate regional cooperative management were suggested to tackle this challenge. Training needs included identification manuals for live animals (targeting management agencies and researchers) and products (mostly for customs monitoring and enforcement). A major benefit of the workshop was that managers from the region met and shared discussions on common issues. In the post-workshop satisfaction forms, all of the participants responded that the activity had been useful for them – emphasizing that the workshop format helped to guide fishery managers through existing publications and connecting science with policy. Please refer to Annex 5, where country reports authored by the participants are presented.

RÉSUMÉ EXÉCUTIF

Dans l'océan Indien, les pêcheries d'holothuries, pour le marché asiatique de produits marins séchés, montrent actuellement des signes de déclin important, dus à des taux d'exploitation non soutenables. Cette situation est préoccupante, car les concombres de mer procurent une source de revenus substantielle pour les hommes et les pays de la région. Cette situation indésirable peut être, en partie, attribuée à une gestion insuffisante. Pour aider les gestionnaires des pêches dans leur prise de décision, ACIAR et la FAO ont réalisé des manuels pragmatiques. Le manuel d'ACIAR offre une «boîte à outils du gestionnaire», qui définit six indicateurs pour identifier le statut d'une pêcherie; le manuel FAO fournit une «feuille de route» pour aider aux décisions sur les mesures de gestion. Alors que ces manuels ont été largement diffusés dans le monde tropical, il a été identifié qu'une approche plus pratique restait nécessaire pour guider les gestionnaires dans l'utilisation de ces manuels. Ce besoin a été satisfait par l'organisation d'une série de groupes de travail intitulés: *Pêcheries d'holothuries: une approche écosystémique pour leur gestion (SCEAM)*. Le premier atelier, focalisé sur les pêcheries du Pacifique tropical ouest, s'est tenu à Fidji en 2011. Le document présente synthétise l'atelier SCEAM de l'océan Indien, qui s'est tenu à Zanzibar, République-Unie de Tanzanie, en novembre 2012. Les participants ont été identifiés et sélectionnés sur leur fonction de gestionnaire, ou de cadre supérieur, ayant une bonne connaissance de la pêcherie de leur pays. Des capacités à contribuer activement au groupe de travail et à influencer les changements ultérieurs dans la gestion de leur pêcherie ont aussi été déterminants dans ce choix. Sur les dix-huit personnes invitées de seize pays, quinze représentants de quatorze pays (à cause de trois défections de dernière minute) ont participé à l'atelier.

Avant le groupe de travail, tous les participants ont rempli une fiche sur leur pêcherie. Ces fiches ont révélé, entre autres, la diversité des opérations de pêche dans la région, ainsi que la variété des besoins en gestion et de capacité des pays. Au début de l'atelier, les participants ont assisté à des séminaires introductifs sur les recherches actuelles et sur l'approche écosystémique pour la gestion des pêcheries d'holothuries. Ensuite, des sessions interactives ont visé à faciliter les discussions de groupe et à proposer des exercices. Après avoir suivi la présentation du guide d'ACIAR dans un séminaire, les participants ont travaillé en groupes sur les six indicateurs du manuel afin de définir le statut de leur pêcherie. Dans cet exercice, dix pêcheries ont été classées «surexploitées» ou «épuisées». Seules deux pêcheries étaient modérément exploitées. En se basant sur ce statut, les participants ont ensuite été guidés sur la feuille de route de la FAO et ensemble ils ont choisi les mesures de régulation et les actions de gestion appropriées à leur pêcherie. Dans ces exercices, l'accent a été mis sur l'importance de l'interprétation des manuels dans le contexte des opérations de pêche et du système institutionnel du pays considéré. Les manuels ne donnent pas de réponses définitives aux problèmes, mais aident le gestionnaire à la prise de décision. Dans un des exercices pour définir les options de gestion, l'objectif prioritaire retenu par les participants a été: «maintenir/restaurer l'abondance des holothuries pour les générations futures».

Les sessions plénières et les discussions tenues à la suite des sessions de travail, ont été un élément important de l'atelier. Les obstacles ou les défis identifiés par les participants ont été classés et discutés. Pendant la session plénière finale, les thèmes de recherche prioritaires pour aider la gestion, et les besoins de formation pour permettre la surveillance et l'application des règlements, ont été identifiés. Les déplacements régionaux/sous régionaux (pêcheurs et marchés) sont souvent apparus comme des problèmes déstabilisants la gestion nationale. Des structures de gouvernance facilitant une gestion régionale coopérative seraient à mettre en œuvre. Les besoins en formation comprennent des manuels d'identification des animaux vivants (à l'usage des agences de gestion et des chercheurs) et des notices (essentiellement pour les services des douanes et d'exécution des règlements). Un bénéfice majeur du groupe de travail a été la rencontre des gestionnaires et leurs discussions sur des sujets communs. Dans les fiches de satisfaction, remplies à l'issue de l'atelier, tous les participants ont répondu que cette réunion leur a été utile, en insistant sur son organisation qui les a guidés sur les publications existantes en reliant la science à la politique. Il est conseillé de se référer à l'Annexe 5, qui présente les rapports nationaux des participants.

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BACKGROUND

1. Sea cucumbers are harvested throughout the world to produce a dried product of its body wall known as “bêche-de-mer” or “trepang”. This product is traded as a luxury food item on the Far East Asian dried seafood market. The high commercial value, the ability to store the product without refrigeration, and the ease of collection in shallow waters make sea cucumber fisheries important sources of income for at least three million fishers in the world (Purcell *et al.*, 2013). In the period 2000–2010, African and Asian countries in, and bordering, the Indian Ocean exported nearly 23 000 tonnes of dried sea cucumber to recipient markets, predominantly in Asia (FAO, 2012a). However, the reliability of catch tonnage is challenged by the fact that some countries do not record or report all catches, and clandestine shipments of products are common (Eriksson, de la Torre-Castro and Olsson, 2012). Decline of sea cucumber resources through widespread overfishing is now affecting coastal communities, and potentially coastal ecosystems, around the world (Toral-Granda, Lovatelli and Vasconcellos, 2008). In the Indian Ocean, nearly half of the documented sea cucumber fisheries appear to be operating at unsustainable levels of exploitation with substantial signs of decline (Conand, 2008). In the Comoros, Egypt, Mauritius, Mayotte, Tanzania and Yemen, fisheries have been closed and moratoria placed on exports in an attempt to curb overfishing and uncontrolled harvests. The dire situation of these fisheries, coupled with their importance to people in rural and marginal areas, captures the need to reform management plans and systems to make them more sustainable towards viability of exploitation rates.

2. In the Western Indian Ocean, the recently completed MASMA sea cucumber project (Marine Science for Management programme funded by the Western Indian Ocean Marine Science Association – WIOMSA) was the first concerted effort in the region to gain a comprehensive understanding on a range of aspects relating to this resource (Conand and Muthiga, 2007). This project was well received in the region and brought together researchers from a number of locations and disciplines. Nearly 20 publications, a number of academic theses, oral presentations and posters at symposiums, and two workshops were produced under this project (www.wiomsa.org/masma).

3. At a global scale, FAO has supported the development of improved management systems for sea cucumber fisheries through a multifaceted programme. Two outputs from the programme have been a technical manual on the ecosystem approach to managing sea cucumber fisheries (Purcell, 2010) and a condensed guidebook on putting the approach into practice (FAO, 2010). The documents provide a “roadmap” for developing and implementing better management of sea cucumber fisheries, and complement a previous “toolbox” manual developed by the Australian Centre for International Agricultural Research (ACIAR) (Friedman *et al.*, 2008). These manuals have been distributed widely already (see Figure 1). However, the task still remains to assist fisheries agencies to use these manuals to design new and practical management plans to save or restore sea cucumber fisheries. To meet this need, in 2011 FAO commissioned a regional workshop in the Pacific entitled “Sea Cucumber Fisheries: An Ecosystems Approach to Management in the Pacific (SCEAM Pacific)” with the support of the Secretariat of the Pacific Community (SPC), ACIAR and Southern Cross University. At the workshop, which was held in Nadi, Fiji, fishery managers and senior fishery officers from 13 Pacific countries and territories worked through the principles within the ACIAR and FAO manuals to produce sets of management measures and actions for each fishery (FAO, 2012b).

4. The workshop satisfaction forms from SCEAM Pacific indicated that this was a successful format for helping agencies decide on management regulations and actions for implementing an ecosystem approach to fisheries (EAF) for their sea cucumber fisheries (FAO, 2012b). A strategy was developed to hold workshops in the SCEAM format in each major region of the tropical world. Shortly after the SCEAM Pacific workshop had been held in November 2011, FAO and WIOMSA partnered to organize the SCEAM Indian Ocean workshop.

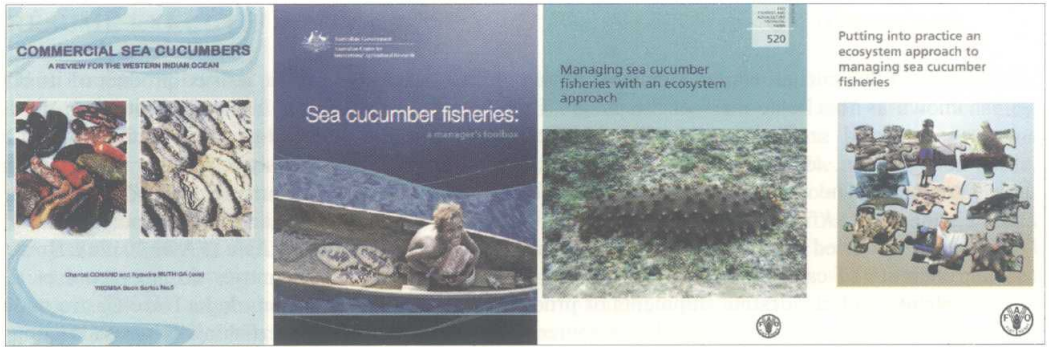


Figure 1. Covers of relevant reports and manuals in order left to right: Conand and Muthiga, 2007; Friedman *et al.*, 2008; Purcell, 2010; and FAO, 2010. See reference list for full citation and links to free downloads.

OBJECTIVES OF THE WORKSHOP

5. The aim of the workshop was to provide a platform for implementing change in management systems through mentoring managers through tailored strategies for sea cucumber fisheries in the Indian Ocean. Embedded within this aim were the objectives to:

- i. provide a forum for group sharing of experiences and lessons learned of sea cucumber fisheries management;
- ii. train and mentor Indian Ocean fisheries managers in applying an ecosystem approach to managing sea cucumber fisheries;
- iii. apply the ACIAR sea cucumber fishery manager's toolbox (Friedman *et al.*, 2008) and the FAO roadmap (Purcell, 2010; FAO, 2010) in the context of each workshop participant's fishery;
- iv. facilitate learning to support development of new plans, or revisions, to sea cucumber fishery management plans where needed;
- v. collate and analyse current information from Indian Ocean sea cucumber fisheries on management practices and constraints.

ORGANIZATION OF THE WORKSHOP

Preparation

6. The workshop broadly followed the format of the SCEAM Pacific workshop (FAO, 2012b), with some modifications due to the increased time available for the workshop. FAO and WIOMSA partnered as organizers of the workshop, with WIOMSA taking on the administrative role and FAO the role of coordinating the technical facilitators and the workshop steering committee. This committee was responsible for identifying participants, and developing the workshop agenda and work programme in March 2012. The members of the steering committee used existing networks to identify and approach potential participants. The organizers evaluated the curriculum vitae of potential participants based on their suitability to attend the workshop. There was a considerable amount of work related to this task, and the identification of participants in the Indian Ocean was perceived as more tedious than in the Pacific. In order to enhance visibility, identity and recognition in the Indian Ocean, a logotype was developed for the workshop.

7. During June and July 2012, the identified participants were sent a letter of invitation including a detailed prospectus of the workshop (Annex 1). In September, once all identified participants had confirmed their participation, a pre-workshop package was sent out containing a fishery data-form, a provisional workshop agenda, and a document for participants to state their pre-workshop expectations. In this e-mail participants were also queried whether they could give a ten-minute presentation of their fishery. Participants were also requested to complete a fishery data-form on how their fishery was operating and on various aspects of its management. Information from the data-form was summarized and reported to the workshop in November. All documentation was prepared by the workshop steering committee with input and approval by the organizers.

Scope

8. The focus of the workshop preparation was to identify and invite relevant staff in nations that have, will soon have or have recently had an operating sea cucumber fishery in the Indian Ocean. The workshop was intended for sea cucumber fisheries managers, senior fishery officers, and staff intimately involved in sea cucumber fisheries in each of the Indian Ocean target countries. Only potential participants from this region that met the requirements were considered and invited to the workshop.

Strategies

9. The number of participants was intentionally kept small, with one representative from each of the participating countries. It was anticipated that this strategy with smaller workgroups would facilitate a greater involvement and higher uptake of information by participants in the workshop. It was also expected that this strategy would also increase the quality of the workshop output.

PROGRAMME, VENUE AND PARTICIPANTS

Programme and venue

10. The workshop was held at Zanzibar Beach Resort, Mazizini, Zanzibar (the United Republic of Tanzania). This venue was selected because previous successful workshops had been arranged there by WIOMSA. The workshop programme was built around eight sessions that encompassed theoretical presentations by facilitators, plenary discussions and practical workgroup sessions where participants worked through the ACIAR and FAO manuals. The title and scope of the sessions are summarized in Table 1 and the detailed workshop agenda can be found in Annex 2.

Participants

11. The workshop targeted fishery managers or senior fishery officers. Eighteen participants from 15 countries were identified and invited to the workshop (Figure 2; Annex 3). In addition, Zanzibar and Rodrigues were invited although they are part of Tanzania and Mauritius, respectively. Last-minute cancellations by Rodrigues, Mozambique and Eritrea precluded other representative for those countries from attending. Participants were selected by the organizers based on how well they met the following criteria:

- i. They had an intimate knowledge of the sea cucumber fishery within their country.
- ii. They were in a position to influence management changes.
- iii. They were able to contribute strongly to the workshop discussions and outputs.

Table 1. Summary of the workshop programme by day and session

Day	Scope	Activity
1	Introduction to the workshop, the fishery situation in the Indian Ocean and to sea cucumber fisheries management	<p>Session 1: Global and regional overviews These presentations focused on exposing the participants to recent global and regional projects relating to sea cucumber fisheries management.</p> <p>Session 2: Managing, assessing and monitoring sea cucumber fisheries This session followed the logical structure of the FAO publication 520 (Purcell, 2010) presenting the ecosystems approach to management. In detail presentations exposed participants to management measures and actions, and the information required for understanding fishery status and making decisions on these measures and actions.</p>
2	Background presentations, status assessments and management indicators	<p>Session 3: Indian Ocean sea cucumber fisheries presentations This session was opened by a presentation summarising the pre-workshop fishery data-forms. Afterwards, participants from eight countries (Egypt, India, Kenya, Madagascar, Seychelles, Yemen, Sri Lanka and the United Republic of Tanzania) made presentations on the status and management challenges of their fisheries.</p> <p>Session 4: Assessments of sea cucumber fisheries using the ACIAR toolbox This was the first practical session where participants identified the status of their fisheries using indicators in the ACIAR sea cucumber fishery manager's toolbox (Friedman <i>et al.</i>, 2008). The participants were divided into three workgroups with one facilitator per group. In the workgroups the participants used the logical system of indicators to identify the status of their fishery.</p>
3	Field day	During the field day, participants surveyed an intertidal seagrass area and snorkelled around Kwale Island identifying sea cucumbers, and visited a sea cucumber processor and trader in Mtoni.
4	Decision support tool and governance	<p>Session 5: Decision-making in sea cucumber fisheries management This session focused on mentoring participants using the roadmap (page 32 in Purcell, 2010; pages 22–23 in FAO, 2010) to make decisions on management measure and actions appropriate to their fishery and its identified status (as identified in Session 4). At the end of the session, each participant had tabulated appropriate measures and actions for their fishery.</p> <p>Session 6: Governance in sea cucumber fisheries To expand the management focus of the workshop, this session consisted of a stakeholder identification exercise. Participants listed and ranked the importance of various actors that participated in policy and rule making and in monitoring and enforcement of their fishery.</p>
5	Contextualizing the workshop for implementation in the Indian Ocean	<p>Session 7: Fisheries cases and enforcement In this session, groups were grouped around four case study fisheries from the region (Oman, Kenya, Sri Lanka and Comoros). The participants from neighbouring countries worked together with the participant from the case study country to identify the main challenges and potential management measures and actions.</p> <p>Session 8: Contextualizing the workshop for implementation in the Indian Ocean This session focused on summarizing discussions from the workshop and identifying key priority research areas for the future.</p>

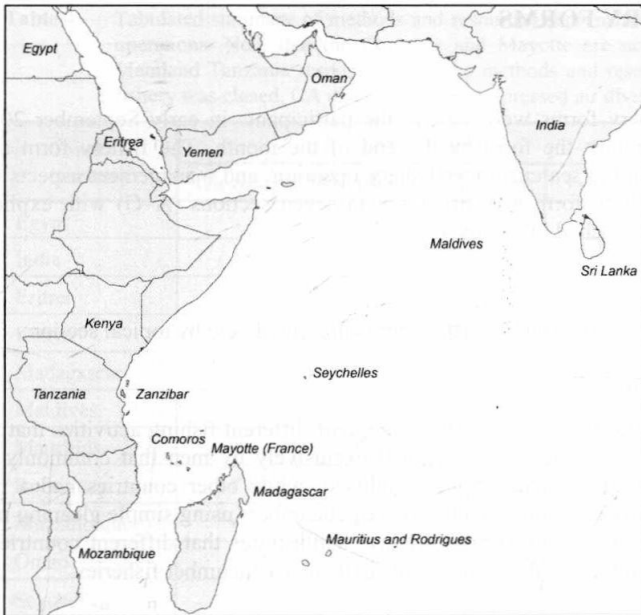


Figure 2. Map over FAO Area 51 (Indian Ocean) with invited and participating countries spelled out in text. Note that officers from Mozambique, Eritrea and Rodrigues were invited and submitted pre-workshop fishery forms, but were not able to participate at the workshop due to administrative complications.

Facilitators

12. The facilitators were required to be knowledgeable on sea cucumber fisheries and have experience in fisheries management. The workshop facilitators were members of the workshop steering committee preparing the delivery of the workshop. In addition, the facilitators jointly chaired and coordinated the workshop and delivered seminar presentations within their fields of expertise. During the workshop, an important component of the facilitator's role was to communicate and lead discussions relevant to the workshop format. The workshop facilitators are listed in Table 2.

Table 2. Facilitators and their role in the workshop

Name	Position	Workshop role
Alessandro Lovatelli	Aquaculture Officer, FAO	Organizer
Julius Francis	Executive Secretary, WIOMSA	Organizer
Hampus Eriksson	Post-doctoral Research Fellow, Stockholm University, Sweden	Workshop coordinator, facilitator and steering committee member
Steven Purcell	Senior Research Fellow, Southern Cross University, Australia	Workshop facilitator and steering committee member
Chantal Conand	Emeritus Professor, La Réunion University, France	Workshop facilitator and steering committee member
Nyawira Muthiga	Director, Kenya Marine Program, Wildlife Conservation Society	Workshop facilitator and steering committee member

PRE-WORKSHOP FISHERY FORMS

Purpose

13. The pre-workshop fishery forms were sent to the participants in early September 2012. The participants were required to return the form by the end of the month. The fishery form aimed at collecting information regarding the sea cucumber fishery operation and management aspects from all participating countries. The fishery form was structured in seven sections (A–G) with explicit aims (Table 3). The full data-form is attached in Annex 4.

Results

14. A summary of relevant results from the data-form is presented here by topical section.

Section A - Fishery operation

15. The represented countries were locations for a range of different fishing activities that targeted sea cucumbers (Table 4). Some fisheries were operated exclusively by men that commonly utilized underwater breathing devices (e.g. Seychelles and Maldives), while other countries had a range of resource users (i.e. men, women and children) collecting sea cucumbers using simple gleaning methods. This diversity of activities was important to note because it illustrates that different countries in the Indian Ocean are facing different management challenges in their sea cucumber fisheries.

Table 3. Summary of the pre-workshop data-form and the aims of the different section within it

Section	Topic	Aim
A	Fishery operation	To capture information regarding how the fishery operates (e.g. Who is fishing? How are they fishing? Where are they fishing?)
B	Human resource capacity and monitoring	To collect information on the capacity of agencies responsible for management in assessing and monitoring the sea cucumber fishery in their country
C	Management approach and governance	To identify strategies and the level of participation of agencies and communities in governance
D	Current fishery regulations	To illustrate how the participant countries are currently regulating sea cucumber fisheries
E	Enforcement and inspection	To identify the capacity to enforce regulations and export protocols
F	Stakeholder involvement and education	To explore the level of management focus on strategies that allow fishers to participate in management
G	Aquaculture	To explore preparedness and ambitions in relation to sea cucumber aquaculture

Table 4. Tabulated summary of methods and resource users in Indian Ocean countries' sea cucumber fishing operations. Note that the Comoros and Mayotte are not included as the fishery is closed there. Mainland Tanzania responded with the methods and resource users that are used illegally since the fishery was closed. CA diving means "compressed air diving" (scuba or hookah).

Country/ territory	Methods				Resource users		
	Gleaning	Skin diving	CA diving	Trawling	Men	Women	Children
Egypt	-	✓	✓	✓	✓	-	-
India	-	✓	-	✓	✓	-	-
Eritrea	-	✓	-	-	✓	✓	-
Kenya	✓	✓	-	-	✓	✓	-
Madagascar	✓	-	✓	-	✓	✓	✓
Maldives	-	✓	✓	-	✓	-	-
Mauritius	✓	✓	✓	-	✓	✓	-
Rodrigues	✓	-	-	-	✓	✓	-
Mozambique	✓	✓	✓	-	✓	✓	✓
Oman	✓	✓	-	-	✓	✓	✓
Seychelles	-	-	✓	-	✓	-	-
Sri Lanka	-	✓	✓	-	✓	-	-
United Republic of Tanzania	✓	✓	✓	-	✓	-	-
Zanzibar	✓	✓	✓	-	✓	✓	✓
Yemen	✓	✓	✓	-	✓	✓	✓

16. In relation to the fishery operation, questions were asked about the number of species that were targeted in each country's fishery. The reported species numbers varied greatly (Figure 3A) and for some countries appears underestimated compared to existing reports (e.g. Conand, 2008; Eriksson *et al.*, 2010). The participants were also asked to state which of the broad categorized habitats were targeted in their country: i) soft bottom with seagrass; ii) coral reefs; iii) sand flats; and iv) deep areas. Most countries' fisheries were operating within at least three different habitats (Figure 3B). The location of each of the represented country determined the habitat that was available for fishing, and this in turn influenced the number of species that could be sourced from within the fishery. This diversity in available habitats and potential diversity of species is important to keep in mind when approaching management measures, such as a list of permissible species and spatial structuring of the fishery through open/closed zones.

Section B - Human resource capacity and monitoring

17. Two central questions of this section related to whether the appropriate agencies in the represented countries had the capacity to conduct extensive underwater populations surveys of sea cucumbers every three years in terms of i) human resources and skills, and ii) the required funding. It was notable in the responses from the participants that while half of the countries lacked human resources and skills to undertake this activity almost all countries appear to lack the funds required for these types of assessments (Figure 4). However, some countries may have research institutions with some capability to conduct surveys, which were not considered in the data form.

Section C - Management approach and governance

18. Out of the participating countries, only six had a national sea cucumber fisheries management plan (Eritrea, India, Madagascar, Mauritius [incl. Rodrigues], Seychelles and Sri Lanka). In conjunction