MOL (Mitsui OSK Lines) Mauritius International Fund for Natural Environment Recovery and Sustainability

Brief Report of Activities during 2023 fiscal year

Joint project with:
The University of Mauritius and
The Biodiversity and Environment institute (NGO)

Title of the Project

A scientific approach for the conservation and restoration of Mauritius Coral Reefs under the combined effects of climate change and marine pollution

Principal Investigator: Beatriz Estela CASARETO, Appointed Professor

Graduate School of Science and Technology (GSST)

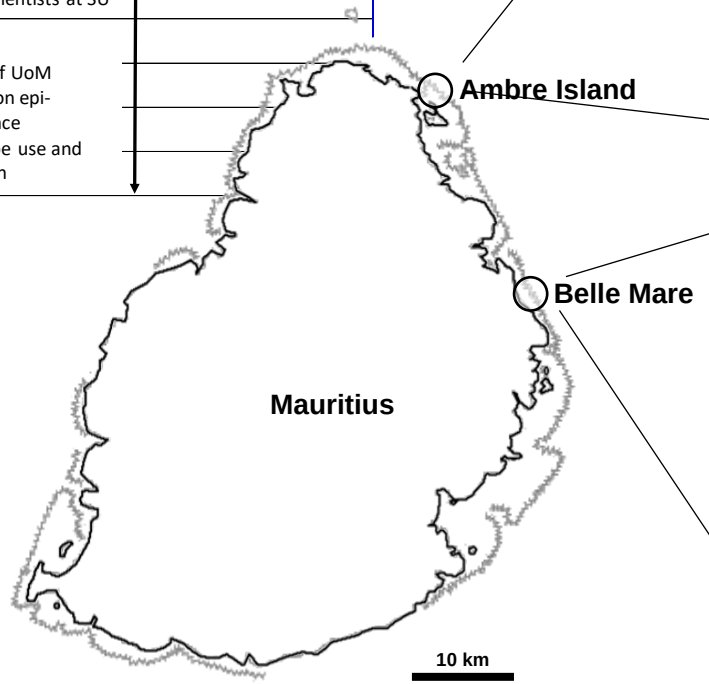
Shizuoka University

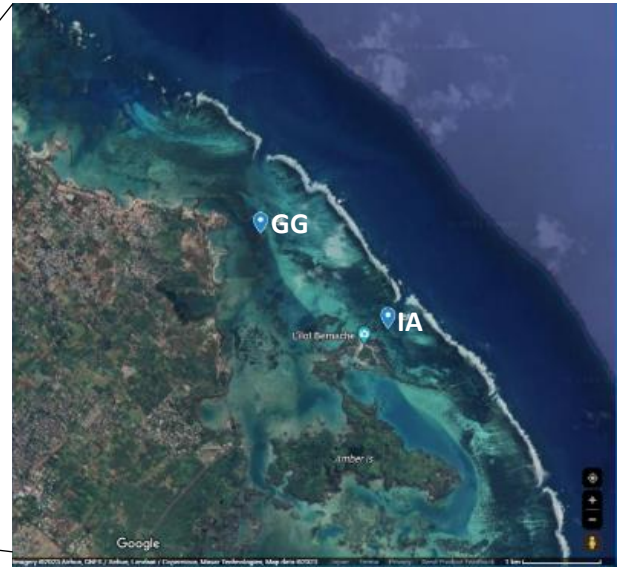
Annual schedule and location of selected fields

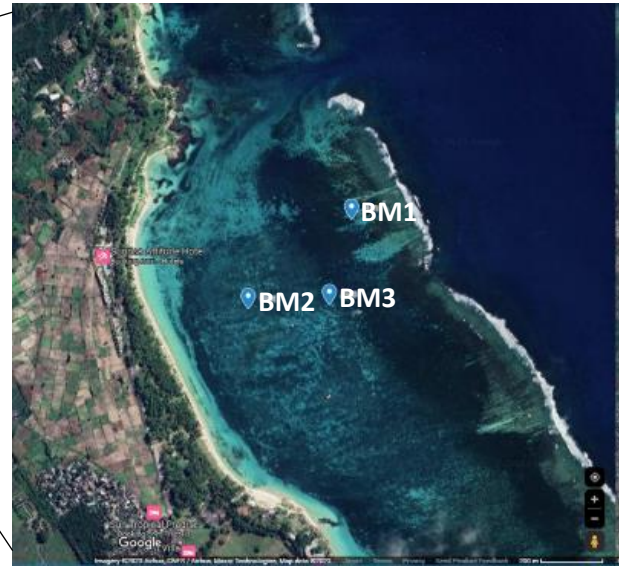
Monthly Activity Plan for FY2023

Month	Activities for the reporting period(Please list all the activities carried out or will carry out during this Year) -Describe any differnces from the original plan-
April	Joint Field survey Su, UoM and BEI
May	On line letures
June	Attendance of 5th APCRS Singapore
July	Field monitoring by UoM and BEI
August	
September	Data anlysis and manuscript preparations; On line letures; Capacity building
October	Joint Field survey Su, UoM and BEI; Lecture on coral incubation techniques and pico-nanoplankton studies
November	Data anlysis for report; Visiting and Training of UoM scientists at SU
December	
January	Preparation of Interim report; Training of UoM students on epi-fluorescence microscope use and application
February	Epi-fluorescent microscope donation ceremony
March (Plan)*	Data anlysis and manuscript writing

Location of the study sites, Belle Mare (BM), Ill d'Ambre (IA), and Gran Gaube (GG) and surveyed stations.







Joint Survey (April 2023)

Belle Mare

Joint SU and UoM field trip at Belle Mare

Plankton sampling

Coral sampling

Sampling point	Belle-Mare Stn.BM1	Belle-Mare Stn.BM2
Sampling time	11:46-12:16	13:19-13:38
Sensor Measurement	11:54-12:16	13:23-13:38
NO3(µM-N)	0.970±0.024	5.074±0.098
NO2(µM-N)	0.131±0.009	0.213±0.002
NH4(µM-N)	0.820±0.153	0.932±0.056
PO4(µM-P)	0.108±0.008	0.074±0.015
SiO2(µM-S)	5.385±0.145	15.730±0.322
POC (µg/L)	38.1±0.3	40.3±0.6
PON (µg/L)	7.6±0.1	8.1±0.1

Some examples of heat resistant coral species

Pavona decussata

Pocillopora verrucosa

Fungia sp.

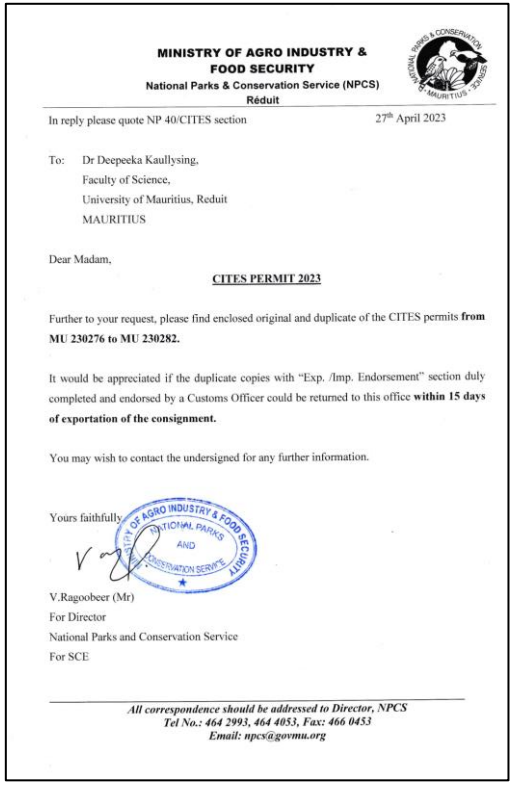
Sampling point	Belle-Mare Stn.BM1	Belle-Mare Stn.BM2
Sampling time	11:46-12:16	13:19-13:38
Sensor Measurement	11:54-12:16	13:23-13:38
Light intensity (µmol/m²/s)	1231±659	486±259
Water temperature (°C)	29.46±0.03	30.06±0.15

Joint Survey (April 2023)

Ille D'ambre-Grand Goube

Surveys in these two sites are dedicated to the study to corals of Genus *Stylophora* which were categorized as endemic in Madagascar areas (*Stylophora madagascarensis*)but recently also found in these regions of Mauritian reefs.

Joint SU and UoM field trip at Ille D'ambre-Grand Goube



MINISTRY OF AGRO INDUSTRY & FOOD SECURITY
National Parks & Conservation Service (NPCS)
Réduit

In reply please quote NP 40/CITES section — 27th April 2023

To: Dr Deepeeka Kaullysing,
Faculty of Science,
University of Mauritius, Reduit
MAURITIUS

Dear Madam,

CITES PERMIT 2023

Further to your request, please find enclosed original and duplicate of the CITES permits **from MU 230276 to MU 230282.**

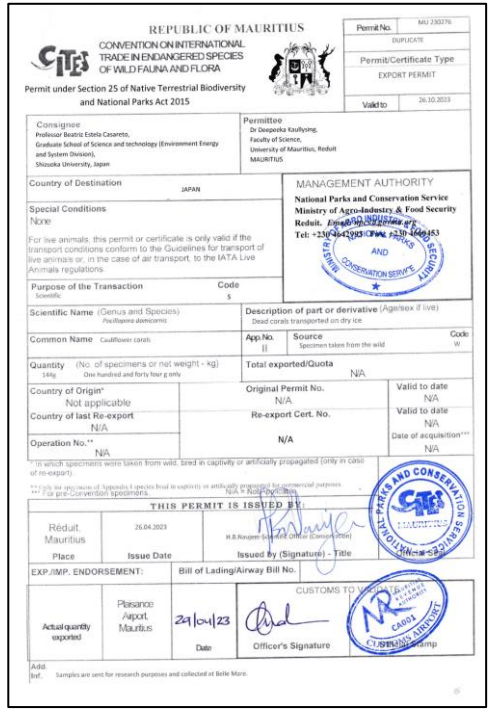
It would be appreciated if the duplicate copies with "Exp. /Imp. Endorsement" section duly completed and endorsed by a Customs Officer could be returned to this office **within 15 days of exportation of the consignment.**

You may wish to contact the undersigned for any further information.

Yours faithfully,

V.Ragoobeer (Mr)
For Director
National Parks and Conservation Service
For SCE

All correspondence should be addressed to Director, NPCS
Tel No.: 464 2993, 464 4053, Fax: 466 0453
Email: npcs@govmu.org



REPUBLIC OF MAURITIUS
CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA
Permit under Section 25 of Native Terrestrial Biodiversity and National Parks Act 2015

Permit No. MU 230276 — DUPLICATE
Permit/Certificate Type: EXPORT PERMIT
Valid to: 26.10.2023

Consignee: Professor Beatriz Estela Casareto, Graduate School of Science and technology (Environement Energy and System Division), Shizuoka University, Japan

Permittee: Dr Deepeeka Kaullysing, Faculty of Science, University of Mauritius, Reduit, MAURITIUS

Country of Destination: JAPAN

Special Conditions: None

For live animals, this permit or certificate is only valid if the transport conditions conform to the Guidelines for transport of live animals or, in the case of air transport, to the IATA Live Animals regulations.

MANAGEMENT AUTHORITY
National Parks and Conservation Service
Ministry of Agro-Industry & Food Security
Réduit, Email: npcs@govmu.org
Tel: +230 464 2993 Fax: +230 466 0453

Purpose of the Transaction: Scientific — Code: S

Scientific Name (Genus and Species): *Pocillopora damicornis* — Description of part or derivative (Age/sex if live): Dead corals transported on dry ice

Common Name: Cauliflower corals — App.No. II — Source: Specimen taken from the wild — Code: W

Quantity (No. of specimens or net weight - kg): 14kg One hundred and forty four g only — Total exported/Quota: N/A

Country of Origin*: Not applicable — Original Permit No.: N/A — Valid to date: N/A

Country of last Re-export: N/A — Re-export Cert. No.: N/A — Valid to date: N/A

Operation No.**: N/A — Date of acquisition***: N/A

(In which specimens were taken from wild, bred in captivity or artificially propagated (only in case of re-export))
** For application of Appendix I species bred in captivity or artificially propagated for commercial purposes
*** For pre-Convention specimens — N/A = Not Applicable

THIS PERMIT IS ISSUED BY:

Réduit, Mauritius — Place — 26.04.2023 — Issue Date — H.B.Rouyer-Director (Officer Delegation) — Issued by (Signature) - Title

EXP./IMP. ENDORSEMENT: — Bill of Lading/Airway Bill No.:

CUSTOMS TO VERIFY

Actual quantity exported: — Pleasance Airport, Mauritius — 29/04/23 — Date — Officer's Signature — CARGO AIRCRAFT — Customs Stamp

Add.
Ref. Samples are sent for research purposes and collected at Belle Mare.

CITES permit

Four different morphotypes of the coral *Stylophora* sp. with some of them showing heat resistant physiological responses

- **We participated in the 5th APCRS with several joint presentations and attendance of 3 mini-symposia**

Poster:

- **Inter-annual variations in population density of the coral-eating crown-of-thorns starfish around a tropical Island of the Western Indian Ocean**
  D Kaullysing*, S Ramah, M Anasamy, S Jogee, BE Casareto, Y Suzuki, R Bhagooli

Oral:

- **Physiological responses of Growth Anomalies on Acropora muricata to short-term light and thermal stress**
  SY Jogee* , S Jeetun, M Ricot, N Taleb-Hossenkhan, S Mattan-Moorgawa, D. Kaullysing, BE Casareto, Y Suzuki, D Seveso, R Bhagooli

- **New Approach for the reduction of reactive oxygen species (ROS) in the Coral holobiont using Vitamin C Micro Capsules.**
  Y.Suzuki*, B. E.Casareto, T. Suzuki, K.Toyoda, D. Kaullysing, R. Bhagooli

- **Physiological responses of the coral *Pocillopora damicornis* under thermal and high nitrate stresses**
  B. E. Casareto*, M. Thummasan, T. Suzuki, Y. Suzuki, D. Kaullysing, R. Bhagooli

- **Identification of non-fluorescent chromoprotein in massive Porites spp. corals manifesting pink pigmentation response (PPR) in Okinawa**
  T. Suzuki*, B.E. Casareto, Y. Suzuki, K. Toyoda, D. Kaullysing, R. Bhagooli

- **Differential Thermally-Induced Antioxidant Enzyme Activities and Oxidative damage among four Reef-Building corals: Implications for Coral susceptibility to Bleaching**
- **R. Bhagooli***

Activities at the University of Mauritius during October 17 to 26, 2023 visit of SU research team to Rep. of Mauritius

Capacity Building

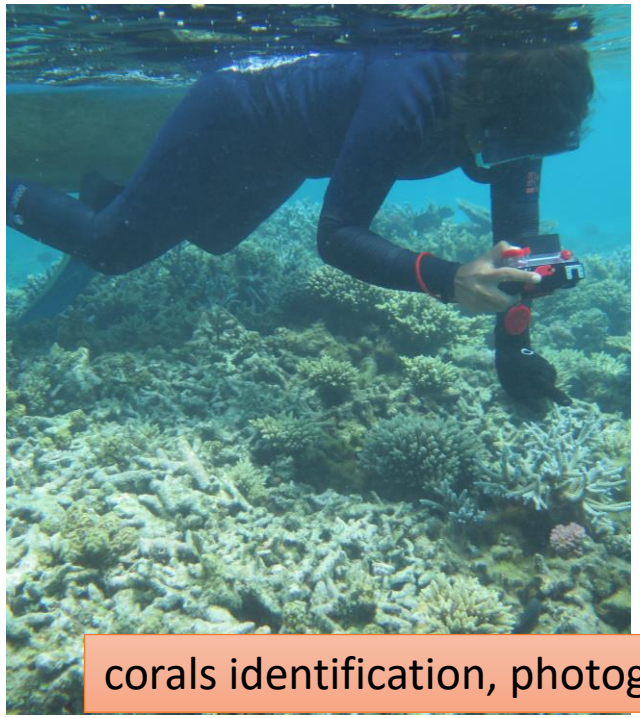
Lecture on methods for coral incubations and pico-nanoplankton studies

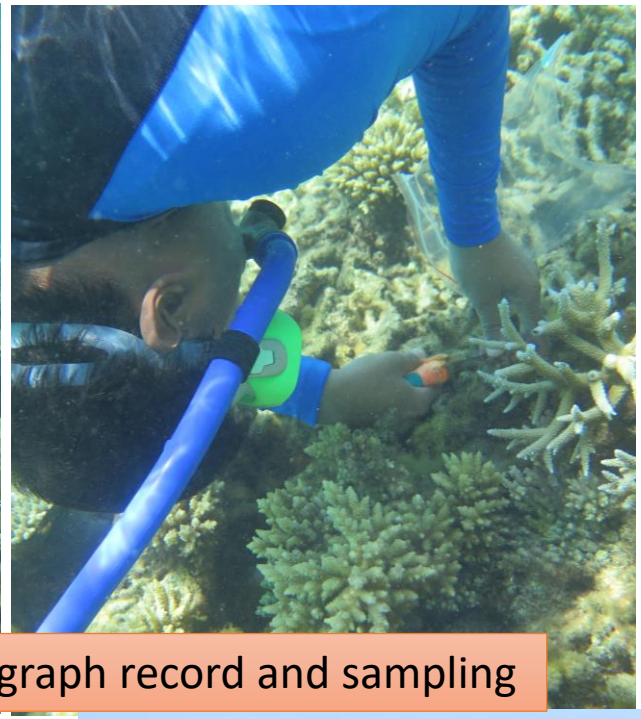
Setup of fluorescence microscope donated from Shizuoka University to the University of Mauritius under the MOL Research Project

From Left: Dr. D. Kaullysing, Prof. Y. Suzuki, Prof. B.E. Casareto, Mr. K. Toyoda, Prof. T. Fujiwara, Prof. R. Bhagooli

Meeting with the Dean of Faculty of Science, UoM, Ass. Prof Dr. Yannick D. Tangman From left: Prof. T Fujiwara, Prof Y. Suzuki, Prof. B.E. Casareto and Prof. Y. D. Tangman.

Joint field Surveys (SU, UoM and BEI) at Belle Mare and Ille D'ambre reef sites during October 20 and 21, 2023. Scientists from SU and UoM with students and members of BEI (NGO) participated in these field trips.



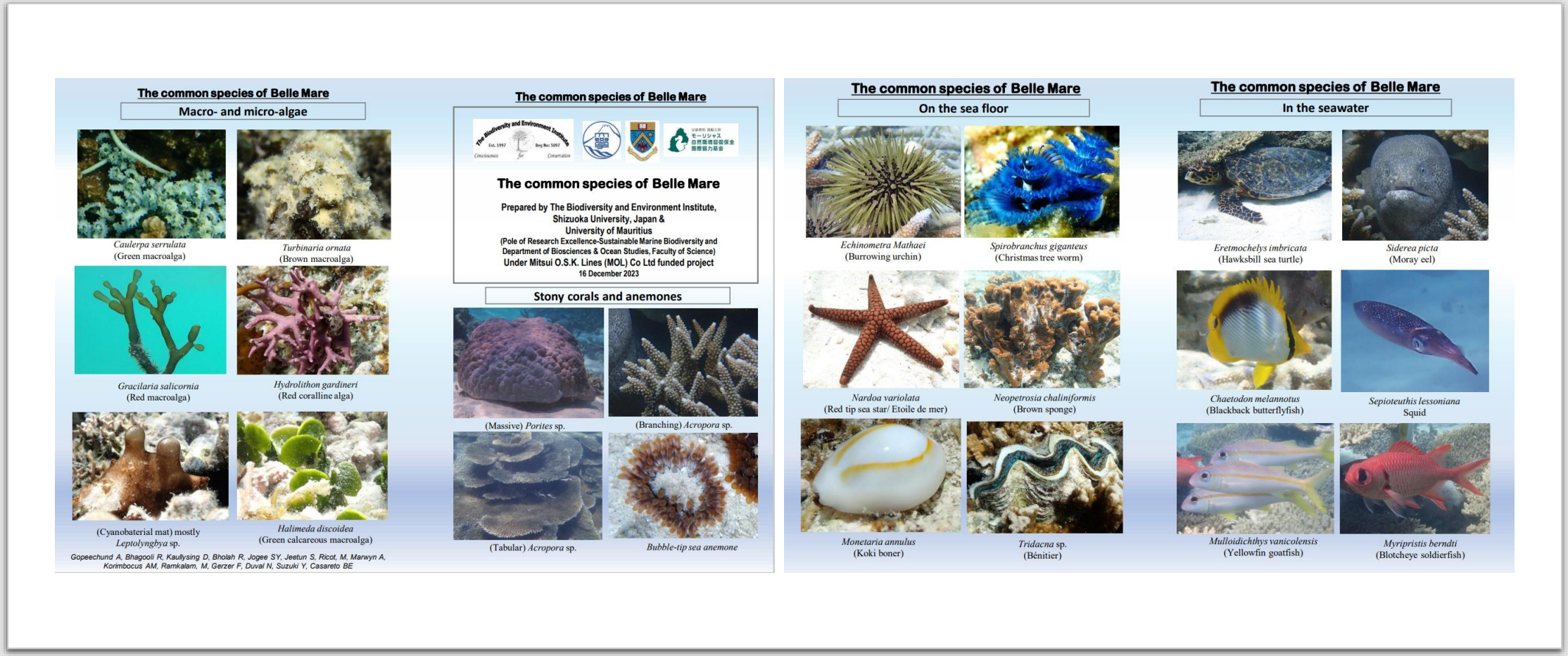


corals identification, photograph record and sampling

Water and plankton sampling

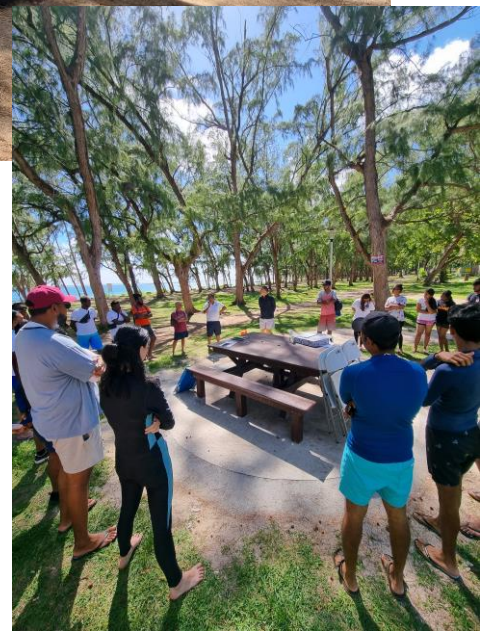
BEI and UoM Field trip activities with citizens (1)

Field trip at Belle Mare on 2023 December 16th (Saturday). Educational field trip to share and sensitize outcomes of the project on the “Marine life at Belle Mare”



BEI and UoM Field trip activities with citizens (2)

Field trip at Belle Mare on 2023 December 16th (Saturday). Educational field trip to share and sensitize outcomes of the project on the “Marine life at Belle Mare”



Prof. R. Bhagooli (UoM) giving academic and safety instructions before starting the activity

Capacity Building: scientific and Social Impact

Joint publication (published October 2023)

diversity

MDPI

Article

First Report of Diseases and Compromised Health Conditions on Hard Corals around Rodrigues Island, Southwest Indian Ocean

Shakeel Yavan Jogee [1], Shivam Gopalsing [1], Sruti Jeetun [1], Melanie Ricot [1], Nawsheen Taleb-Hossenkhan [1], Sushma Mattan-Moorgawa [1,2], Deepeeka Kaullysing [1,2], Diah Permata Wijayanti [3], Beatriz Estela Casareto [4], Yoshimi Suzuki [4] and Ranjeet Bhagooli [1,2,3,5,6,*]

1 Department of Biosciences and Ocean Studies, Faculty of Science & Pole of Research Excellence in Sustainable Marine Biodiversity, University of Mauritius, Réduit 80837, Mauritius; shakeeljogee96@gmail.com (S.Y.J.); mrshivam2401@gmail.com (S.G.); sruti.jeetun@gmail.com (S.J.); mmelaniericot@gmail.com (M.R.); n.taleb@uom.ac.mu (N.T.-H.); s.moorgawa@uom.ac.mu (S.M.-M.); de.kaullysing@uom.ac.mu (D.K.)
2 The Biodiversity and Environment Institute, Réduit 80837, Mauritius
3 Department of Marine Science, Faculty of Fisheries and Marine Science, Diponegoro University, Jalan Prof. Soedarto SH, Kampus Tembalang, Semarang 50275, Indonesia; diah_permata@mail.com
4 Graduate School of Science and Technology, Shizuoka University, Suruga-ku, Shizuoka 422-8529, Japan; becasar@shizuoka.ac.jp (B.E.C.); suzuki.yoshimi@shizuoka.ac.jp (Y.S.)
5 The Society of Biology (Mauritius), Réduit 80837, Mauritius
6 Institute of Oceanography and Environment (INOS), Universiti Malaysia Terengganu, Kuala Nerus, Kuala Terengganu 21030, Malaysia
* Correspondence: r.bhagooli@uom.ac.mu

Abstract: Coral diseases represent a prominent menace to coral reefs and to the associated ecological services they provide to the surrounding coastal communities. Studies on diseases and compromised health conditions (CHCs) on hard corals in the Southwest Indian Ocean (SWIO) are scarce, and their consequences are often overlooked. This study aimed to establish the baseline prevalence of diseases and CHC of hard corals around Rodrigues Island. Coral disease and CHC prevalence were visually assessed using 2 m × 50 m belt transects at eight sites around the island. This is the first report of four coral diseases, namely White Plague (WP), White Syndrome (WS), Black Band (BB), and Growth Anomalies (GA), and two CHCs, two forms of Pink Pigmentation Responses (PPR)—Pink Patches (PP) and Pink Line Syndrome (PLS)—observed on six genera of hard corals from the island of Rodrigues. PP on *Fungia* (15.92 ± 5.65%), followed by the WS on *Montipora* (4.67 ± 3.72%) and GA on *Gardineroseris* (4.16 ± 4.16%), so far unreported from the SWIO, were the most prevalent around the island. The least prevalent disease was BB on *Montipora* (0.13 ± 0.13%). Although the overall disease and CHC prevalence for Rodrigues Island (0.98 ± 0.30%) were much lower than the surrounding islands in the SWIO, the observations of these diseases and CHCs on hard corals and relevant environmental parameters warrant further in-depth characterization to better inform coral reefs management and conservation actions.

Keywords: coral disease; compromised coral health; disease prevalence; Rodrigues Island

check for updates

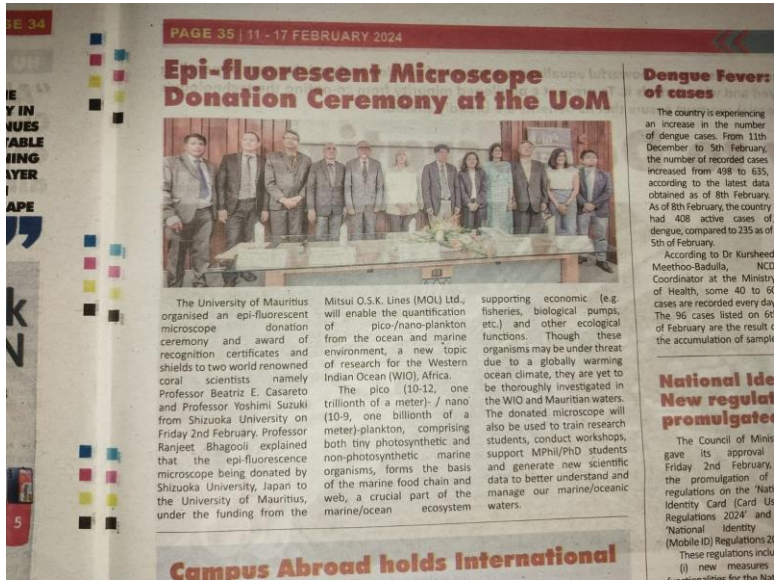
Citation: Jogee, S.Y.; Gopalsing, S.; Jeetun, S.; Ricot, M.; Taleb-Hossenkhan, N.; Mattan-Moorgawa, S.; Kaullysing, D.; Wijayanti, D.P.; Casareto, B.E.; Suzuki, Y.; et al. First Report of Diseases and Compromised Health Conditions on Hard Corals around Rodrigues Island, Southwest Indian Ocean. *Diversity* **2023**, *15*, 1086. https://doi.org/10.3390/d15101086

Academic Editor: Simone Montano

Received: 30 August 2023
Revised: 12 October 2023
Accepted: 13 October 2023
Published: 15 October 2023

Media coverage

MBC TV interviewed Prof. Beatriz E. CASARETO. (Feb. 2, 2024). Important sections of the Donation Ceremony of Epi-fluorescent microscope by Shizuoka University to University of Mauritius, were released to TV audience on the Evening News of February 2



PAGE 35 | 11 - 17 FEBRUARY 2024

Epi-fluorescent Microscope Donation Ceremony at the UoM

The University of Mauritius organised an epi-fluorescent microscope donation ceremony and award of recognition certificates and shields to two world renowned coral scientists namely Professor Beatriz E. Casareto and Professor Yoshimi Suzuki from Shizuoka University on Friday 2nd February. Professor Ranjeet Bhagooli explained that the epi-fluorescence microscope being donated by Shizuoka University, Japan to the University of Mauritius, under the funding from the Mitsui O.S.K. Lines (MOL) Ltd., will enable the quantification of pico-/nano-plankton from the ocean and marine environment, a new topic of research for the Western Indian Ocean (WIO), Africa.

The pico (10-12, one trillionth of a meter)- / nano (10-9, one billionth of a meter)-plankton, comprising both tiny photosynthetic and non-photosynthetic marine organisms, forms the basis of the marine food chain and web, a crucial part of the marine/ocean ecosystem supporting economic (e.g. fisheries, biological pumps, etc.) and other ecological functions. Though these organisms may be under threat due to a globally warming ocean climate, they are yet to be thoroughly investigated in the WIO and Mauritian waters. The donated microscope will also be used to train research students, conduct workshops, support MPhil/PhD students and generate new scientific data to better understand and manage our marine/oceanic waters.

Campus Abroad holds International

Dengue Fever: of cases

The country is experiencing an increase in the number of dengue cases. From 11th December to 5th February, the number of recorded cases increased from 498 to 635, according to the latest data obtained as of 8th February. As of 8th February, the country had 408 active cases of dengue, compared to 235 as of 5th of February.

According to Dr Kursheed Meethoo-Baduilla, NCD Coordinator at the Ministry of Health, some 40 to 60 cases are recorded every day. The 96 cases listed on 6th of February are the result of the accumulation of sampl

National Ide New regulat promulgate

The Council of Minis gave its approval Friday 2nd February, the promulgation of regulations on the 'Nati Identity Card (Card Us Regulations 2024' and 'National Identity (Mobile ID) Regulations 2

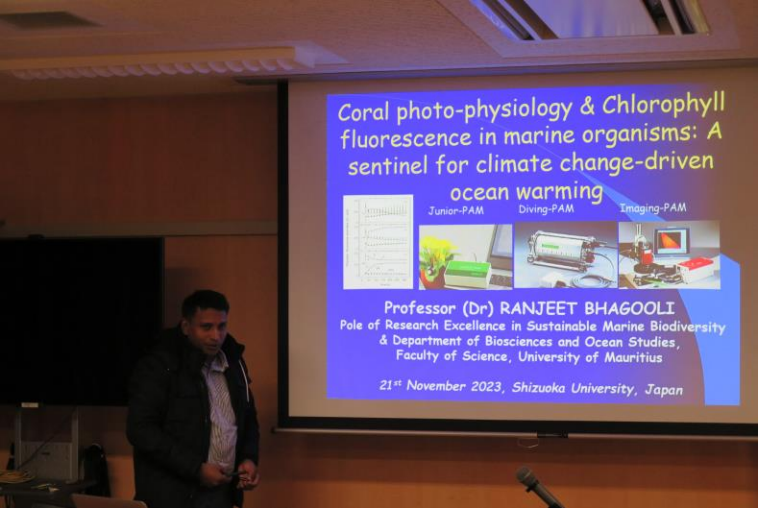
These regulations inclu (i) new measures

The Newspaper **L'Hebdo NEWs Journal on Sunday (Feb. 11, 2024)** published details of the Donation Ceremony of Epi-fluorescent microscope by Shizuoka University to University of Mauritius.

University of Mauritius Scientists visit to Shizuoka University (November 20 to 24, 2023) (1)

Meeting with Prof. M. Hara, Dean of the Graduate School of Science and Technology
(From left: Dr. D. Kaullysing; Prof. Hara; Prof. R. Bhagooli; Prof. B.E. Casareto). Nov. 20, 2023

Meeting with Prof. K. Hizume, President of Shizuoka University
(From left: Dr. D. Kaullysing; Prof. R. Bhagooli; Prof. B.E.Casareto; Prof. K. Hizume). Nov. 20, 2023



Presentation by Prof. Dr. Ranjeet BHAGOOLI

Presentation by Dr. Deepeeka KAULLYSING

GSST Seminar

創造科学技術大学院特別セミナー

MAURITIUS

Title of Seminar（セミナータイトル）:

A SCIENTIFIC APPROACH FOR THE CONSERVATION AND RESTORATION OF MAURITIUS CORAL REEFS UNDER CLIMATE CHANGE AND MARINE POLLUTION SCENARIO

(Research project under the MOL Mauritius International Fund for Natural Environment Recovery and Sustainability)

Organizer（主催者）:

Prof. B. E. CASARETO,

Lab. of Biogeochemistry, GSST, Shizuoka University

Invited speakers: **Prof. Dr. Ranjeet BHAGOOLI** and

Senior lecturer **Dr. (Miss) Deepeeka KAULLYSYNG**

Department of Biosciences and Ocean Studies, Faculty of Science,
UNIVERSITY OF MAURITIUS, Réduit, Republic of Mauritius

Presenters and titles:

14:00-14:20: Dr. B. E. CASARETO welcome and brief introduction to the project
14:20-14:50: Dr. Ranjeet BHAGOOLI: Photo-physiology of Corals under the effect of Climate change
14:50-15:00: break
15:00-15-30: Deepeeka KAULLYSYNG: Studies on coral-eating gastropods in Mauritius.
15:30-16:00: Discussions and final remarks

Place and Date （日時・場所）:

November 21, from 14:00

理学部A棟2階　209 大会議室

Introduction of the Seminar by Prof. B. E. CASARETO

Introduction of the Joint Project by Prof. B. E. CASARETO

University of Mauritius Scientists visit to Shizuoka University (November 20 to 24, 2023) (3)

Training on the application of fluorescent microscope

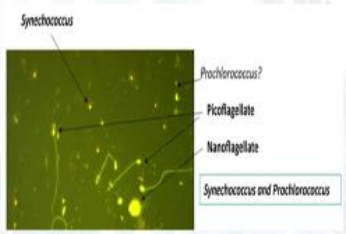
Capacity Building: scientific and Social Impact

公益信託 商船三井
モーリシャス
自然環境回復保全
国際協力基金

Donation Ceremony of Epi-fluoresence microscope by Shizuoka University to University of Mauritius

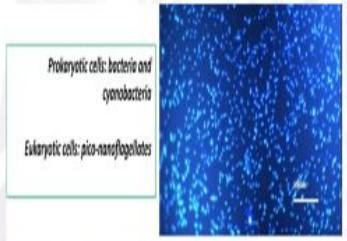
&

Award of Recognition Certificates and Shields to Prof. (Dr) Beatriz E. Casareto & Prof. (Dr) Yoshimi Suzuki



Organised by

University of Mauritius



(Pole of Research Excellence-Sustainable Marine Biodiversity and Department of Biosciences & Ocean Studies, Faculty of Science)

Date: 2 February 2024
Venue: Lecture Theatre II, NAC, University of Mauritius, Réduit

Donation Ceremony Epi-fluorescent microscope by Shizuoka University to University of Mauritius February 2, 2024
Venue: Lecture Theatre II, NAC, University of Mauritius (1)

UNIVERSITY OF MAURITIUS

(Tentative Programme)

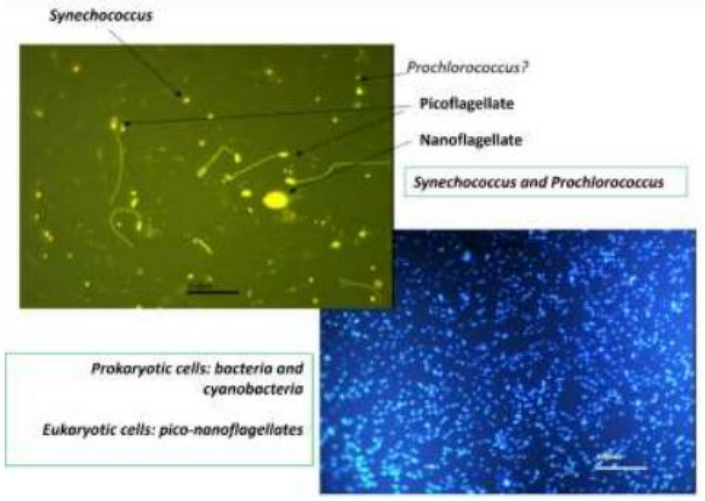
Friday 02 February 2024, Lecture Theatre 2, NAC, Réduit, UoM	
Time	**Activity (MC - Professor (Dr) Ranjeet BHAGOOLI)**
13:45 – 14:00	Registration
14:00 – 14:10	Welcome Address by Professor (Dr) Sanjeev Kumar SOBHEE, Vice-Chancellor of the University of Mauritius
14:10 – 14:20	Address by Mr. Koichiro NINOMIYA, Head of Sustainability and non-Energy Business, Europe & Africa Region, Mitsui O.S.K. Lines (MOL) (Europe Africa) Ltd.
14:20 – 14:30	Address by Mrs. Yuki TANAKA, the Deputy Head of Mission, Embassy of Japan to Mauritius
14:30 – 14:50	Donation Ceremony protocol - Epifluorescence Microscope
14:50 – 15:10	Award of Recognition Certificates and Shields to Professor (Dr) Beatriz E CASARETO & Professor (Dr) Yoshimi SUZUKI
15:10 – 15:15	Remarks from Professor (Dr) Beatriz E CASARETO, Shizuoka University, Japan
15:15 – 15:20	Remarks from Professor (Dr) Yoshimi SUZUKI, , Shizuoka University, Japan
15:20 – 15:35	Refreshments

Organising Team: *Associate Professor (Dr) Désiré Yannick TANGMAN, Dean, Faculty of Science*
Dr Deepeeka KAULLYSING, Department of Biosciences & Ocean Studies, Faculty of Science & Pole of Research Excellence in sustainable Marine Biodiversity
Professor (Dr) Ranjeet BHAGOOLI, Department of Biosciences & Ocean Studies, Faculty of Science & Pole of Research Excellence in sustainable Marine Biodiversity

Epifluorescence Microscope (Nikon ECLIPSE Ci-L plus)

(Source: www.microscope.healthcare.nikon.com)

The epifluorescence microscope being donated by Shizuoka University, Japan to the University of Mauritius will enable the quantification of pico-/nano-plankton from the ocean and marine environment, a new topic of research for the Western Indian Ocean (WIO), Africa. The pico (10^{-12})- / nano (10^{-9})-plankton, comprising both tiny photosynthetic and non-photosynthetic marine organisms, forms the basis of the marine food chain and web, a crucial part of the marine/ocean ecosystem supporting economic (e.g. fisheries, biological pumps, etc.) and other ecological functions. Though these organisms may be under threat due to a globally warming ocean climate, they are yet to be thoroughly investigated in the WIO and Mauritian waters. The donated microscope will also be used to train research students, conduct workshops, support MPhil/PhD students and generate new scientific data to better understand and manage our marine/oceanic waters.



Pico- and nano-plankton observed under epifluorescence microscope.
(*Photo courtesy: Prof BE Casareto*)

Donation Ceremony Epi-fluorescent microscope (2)
Introductory and salutation speaks by several authorities

Prof. R. BHAGOOLI, UoM

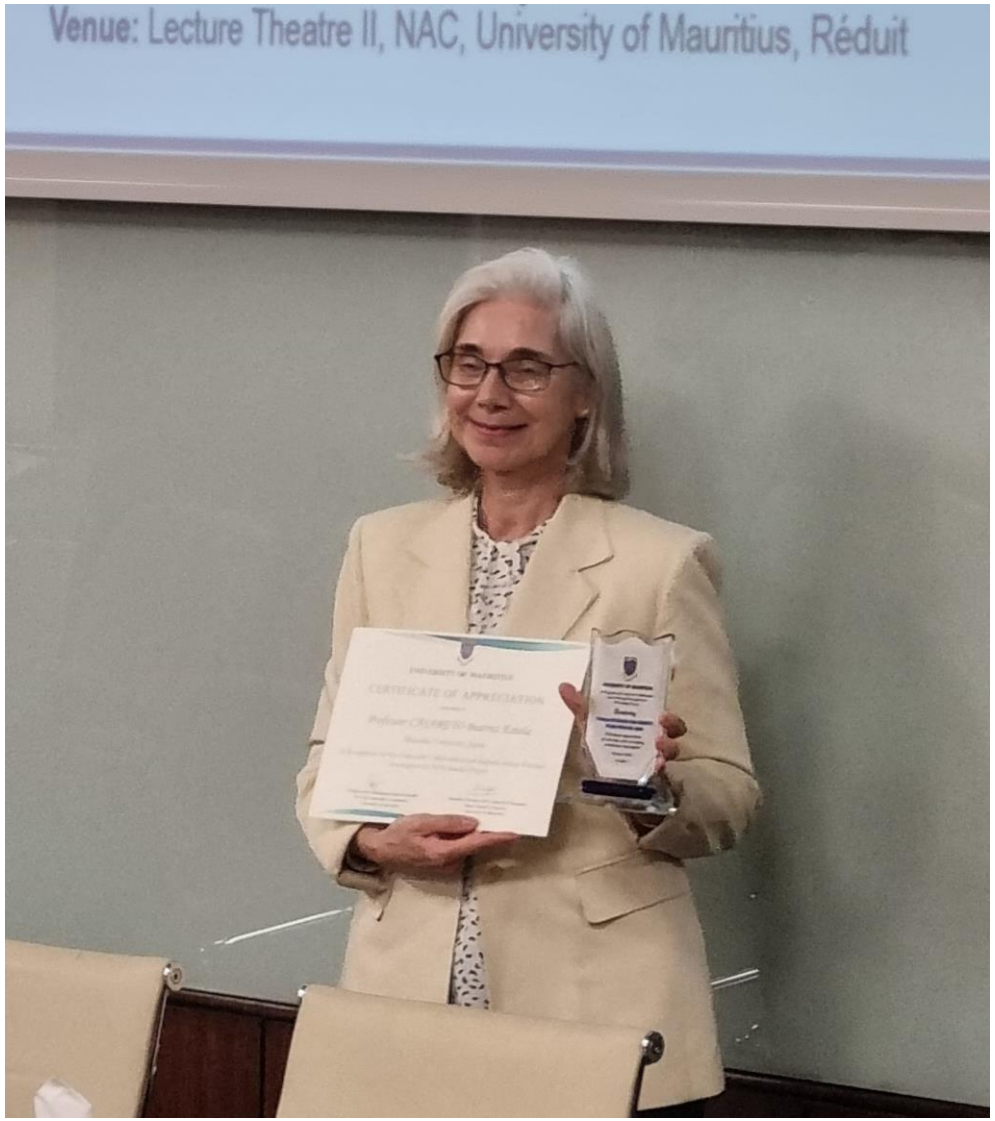
Prof. S. K. SOBHEE, Vice-Chancellor UoM

Mr. Y. MUNBODH permanent secretary
Ministry Education Tertiary Education
Science and Technology

Miss Y. TANAKA
Deputy Head of Mission
Embassy of Japan in Mauritius

Mr. K. NINOMIYA Head of Sustainability and Non-Energy business, MOL

Prof CASARETO (Shizuoka University) received a diploma and sheal from Professor S. K. SOHBEE, vice-chancellor, University of Mauritius (left) and Mr. P CHITAMUN, SCK, Pro-Chairperson of Council, University of Mauritius



Publications and manuscript submissions

First Report of Diseases and Compromised Health Conditions on Hard Corals around Rodrigues Island, Southwest Indian Ocean. (2023) Jogee SY, Gopalsing S, Jeetun S, Ricot M, Taleb-Hossenkhan N, Mattan-Moorgawa S, Kaullysing D, Wijayanti DP, Casareto BE, Suzuki Y, Bhagooli R. **Diversity 2023, 15, 1086.** DOI: https://doi.org/10.3390/d15101086

Variable prevalence of diseases and compromised health conditions on hard corals around Mauritius Island, Western Indian Ocean (**2024**) Jogee SY, Gopalsing S, Jeetun S, Ricot M, Taleb-Hossenkhan N, Mattan-Moorgawa S, Kaullysing D, Wijayanti DP, Suzuki Y, Casareto BE, Bhagooli R., **Bulletin of Marine Science** DOI: https://doi.org/10.5343/bms.2023.0123

Coexistence of nonfluorescent chromoproteins and fluorescent proteins in massive *Porites* spp. corals manifesting a pink pigmentation response (**2024**). **Front. Physiol. 15:1339907**. doi: 10.3389/fphys.2024.1339907
Toshiyuki Suzuki, Beatriz E. Casareto, Mathinee Yucharoen, Hideo Dohra, Yoshimi Suzuki

Submission of manuscripts that are now under review:

First reports of *Stylophora madagascarensis* and *Pocillopora acuta* and their thermal photo-physiological stress responses from Mauritius. (Submitted to **Bulletin of Marine Science** in October 2023) Sruti Jeetun, Melanie Ricot, Shakeel Yavan Jogee, Deepeeka Kaullysing, Nawsheen Taleb-Hossenkhan, Todd Christopher LaJeunesse, Grégory Philipart, Olivier Collard, Jean-François Flot, Diah Permata Wijayanti, Mathinee Yucharoen, Bernado Nascimento, Yoshimi Suzuki, Beatriz Estela Casareto, Ranjeet Bhagooli.

Some selected biogeochemical data collected at the two selected fields during February and October, 2023

Nutrients and particulate organic carbon and nitrogen (POC and PON) concentrations in the seawater

[April]

Date	2023/4/22	2023/4/22	2023/4/22	2023/4/25	2023/4/25
Sampling point	Belle-Mare Stn.BM1	Belle-Mare Stn.BM2	Belle-Mare Stn.BM3	Ill d'Ambre Stn.IA	Gran Gaube Stn.GG
NO3(µM-N)	0.444 ±0.027	0.232 ±0.006	0.403 ±0.016	0.092 ±0.013	1.671±0.006
NO2(µM-N)	0.031 ±0.006	0.053 ±0.005	0.086 ±0.011	0.035 ±0.003	0.126±0.004
NH4(µM-N)	0.745 ±0.071	0.859 ±0.050	0.784 ±0.026	0.818 ±0.037	0.593±0.028
PO4(µM-P)	0.148 ±0.036	0.143 ±0.013	0.137 ±0.013	0.105 ±0.003	0.096±0.016
SiO2(µM-S)	2.960 ±0.070	2.988 ±0.128	3.096 ±0.083	2.830 ±0.048	7.380±0.127
POC (µg/L)	104.0	68.8	69.0	126.0	101.0
PON (µg/L)	15.0	12.5	15.0	28.0	21.0

[October]

Date	2023/10/20	2023/10/20	2023/10/20	2023/10/21	2023/10/21
Sampling point	Belle-Mare Stn.BM1	Belle-Mare Stn.BM2	Belle-Mare Stn.BM3	Ill d'Ambre Stn.IA	Gran Gaube Stn.GG
NO3(µM-N)	0.386 ±0.032	1.228 ±0.038	0.167 ±0.030	0.168 ±0.019	3.477±0.025
NO2(µM-N)	0.068 ±0.003	0.128 ±0.010	0.073 ±0.005	0.046 ±0.010	0.125±0.009
NH4(µM-N)	0.578 ±0.026	0.940 ±0.064	0.608 ±0.019	0.479 ±0.083	0.537±0.027
PO4(µM-P)	0.376 ±0.081	0.429 ±0.039	0.389 ±0.119	0.471 ±0.005	0.398±0.005
SiO2(µM-S)	2.540 ±0.109	7.199 ±0.228	3.013 ±0.233	3.993 ±0.044	12.76±0.401
POC (µg/L)	51.3	77.3	69.3	80.3	70.3
PON (µg/L)	11.7	20.7	15.7	21.7	22.7

Nitrate and Silicate concentrations was high in October than in April, particularly at Grand Goube, Nitrate and Silicate concentrations were high in comparison with other sites, most probably indicating inflow of freshwater. In BM2 the concertation of Nitrate and Silica were also high, and this could indicate the influence of groundwater flashes into the shallow coastal area of the lagoon.

POC and PON were high in April than October, reflecting higher productivity in post summer than in October (fall).

Pigments concentrations in the seawater

[April]

	Peridinin	Fucoxanthin	Diadinoxanthin	Zeaxanthin	DV-chl *a*	Chl *a*-allomer	Chl *a*	Total Chl *a*
BM1	0.05	0.17	0.01	0.10	0.00	0.08	0.35	0.43
BM2	0.01	0.18	0.02	0.06	0.00	0.10	0.52	0.63
BM3	0.02	0.21	0.01	0.05	0.00	0.06	0.52	0.59
IA	0.03	0.21	0.01	0.03	0.00	0.15	0.55	0.70
GG	0.02	0.30	0.03	0.05	0.00	0.31	0.58	0.89

(µg pigments/L seawater)

[October]

	Peridinin	Fucoxanthin	Diadinoxanthin	Zeaxanthin	DV-chl *a*	Chl *a*-allomer	Chl *a*	Total Chl *a*
BM1	0.00	0.04	0.00	0.00	0.04	0.03	0.31	0.38
BM2	0.00	0.14	0.06	0.01	0.00	0.05	0.59	0.64
BM3	0.00	0.08	0.02	0.00	0.00	0.03	0.31	0.34
IA	0.00	0.23	0.03	0.00	0.00	0.04	0.75	0.79
GG	0.00	1.17	0.14	0.00	0.00	0.00	2.60	2.60

(µg pigments/L seawater)

Chl *a* was higher in April than in October. Chl-*a*-allomer (an oxidative form of chlorophyll *a*) was high in April, indicating some oxidative damage in the phytoplankton community.

In October, the presence of DV-chl-*a* (tracer pigment for the pico-cyanobacteria *Prochlorococcus* sp.) shows the presence of *Prochlorococcus* sp. at Stn.BM1, which indicates the inflow of open ocean water into the reef.

Some selected biogeochemical data from the two selected fields

Abundance of bacteria (BA), pico-cyanobacteria (PCY), and heterotrophic pico-, nano-flagellates (HPNF)

[April]

Station		Cells ml^{-1}
Belle-Mare (Stn.BM1)	**BA**	193,864
	PCY	4,635
	HPNF	151
Belle-Mare (Stn.BM2)	**BA**	265,644
	PCY	6,895
	HPNF	75
Belle-Mare (Stn.BM3)	**BA**	245,297
	PCY	3,165
	HPNF	151
Ill d'Ambre (Stn.IA)	**BA**	720,630
	PCY	2,374
	HPNF	10
Gran Gaube (Stn.GG)	**BA**	350,424
	PCY	5,539
	HPNF	10

[October]

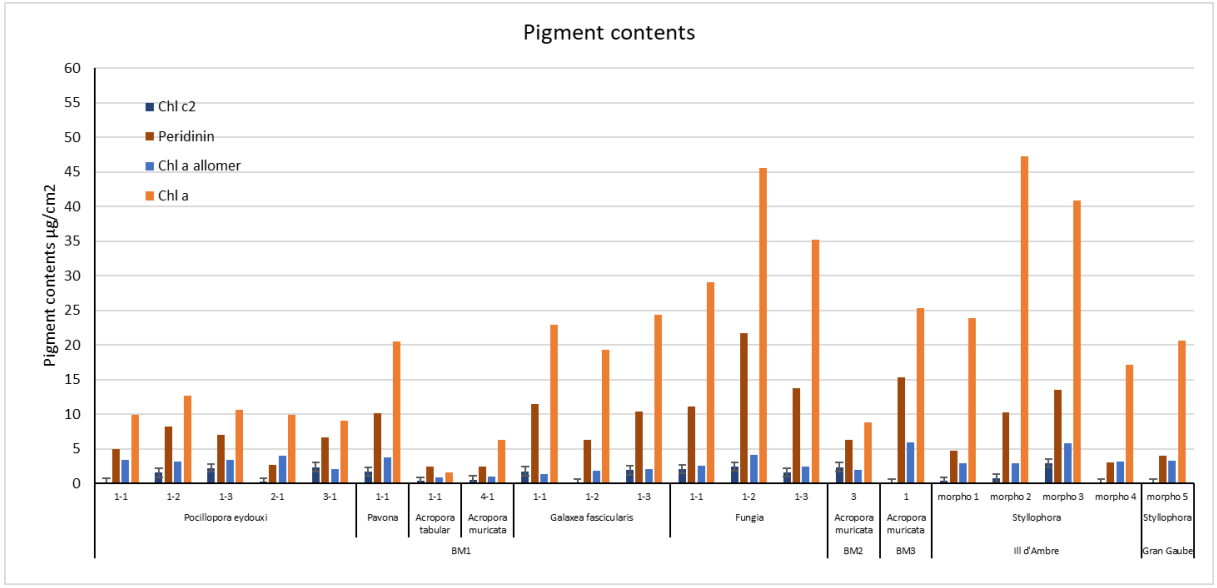
Station		Cells ml^{-1}
Belle-Mare (Stn.BM1)	**BA**	142,883
	PCY	3,391
	HPNF	10
Belle-Mare (Stn.BM2)	**BA**	1,238,918
	PCY	1,809
	HPNF	75
Belle-Mare (Stn.BM3)	**BA**	333,468
	PCY	1,470
	HPNF	188
Ill d'Ambre (Stn.IA)	**BA**	225,289
	PCY	7,687
	HPNF	75
Gran Gaube (Stn.GG)	**BA**	524,129
	PCY	46,346
	HPNF	151

Pico-nano plankton concentrations varied with seasons and sites. In Belle Mare bacteria concentration increased from the reef crest towards the near shore station; particularly in October at Stn. BM2 (near shore) bacteria concentration was the highest. In October at Stn. GG, PCY density was high confirming that *Prochlorococcus* was enriched due to inflow of open ocean waters. with the open

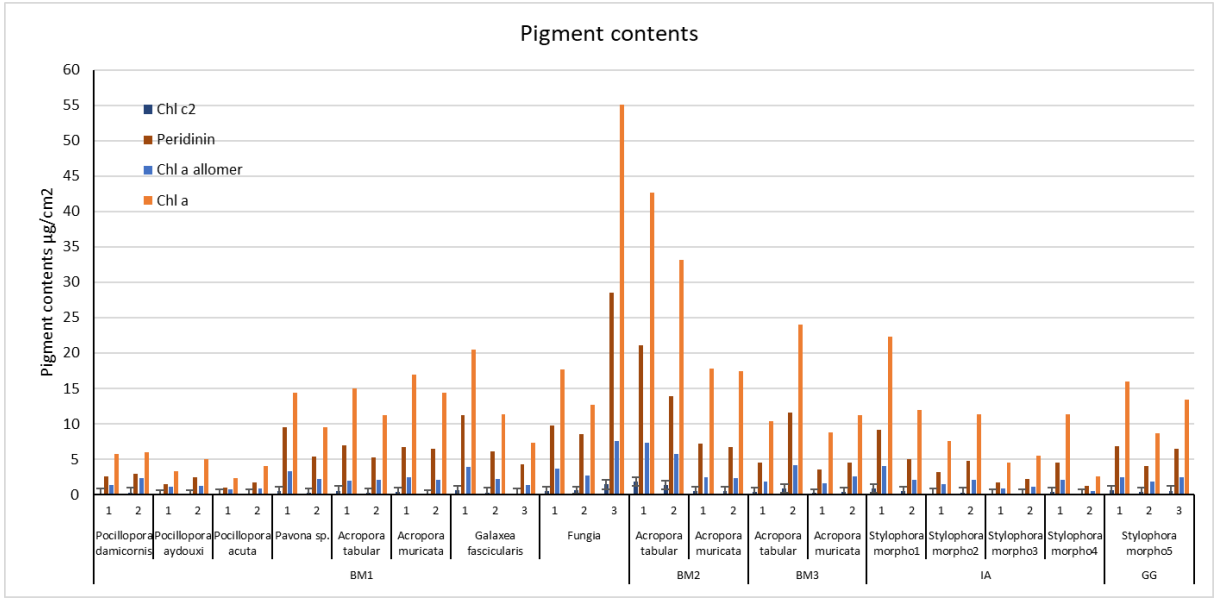
Physiological parameters of selected coral sampled at Belle Mare and Ille d'Ambre-Grand Gaube

Photosynthetic pigment concentrations

[April]



[October]

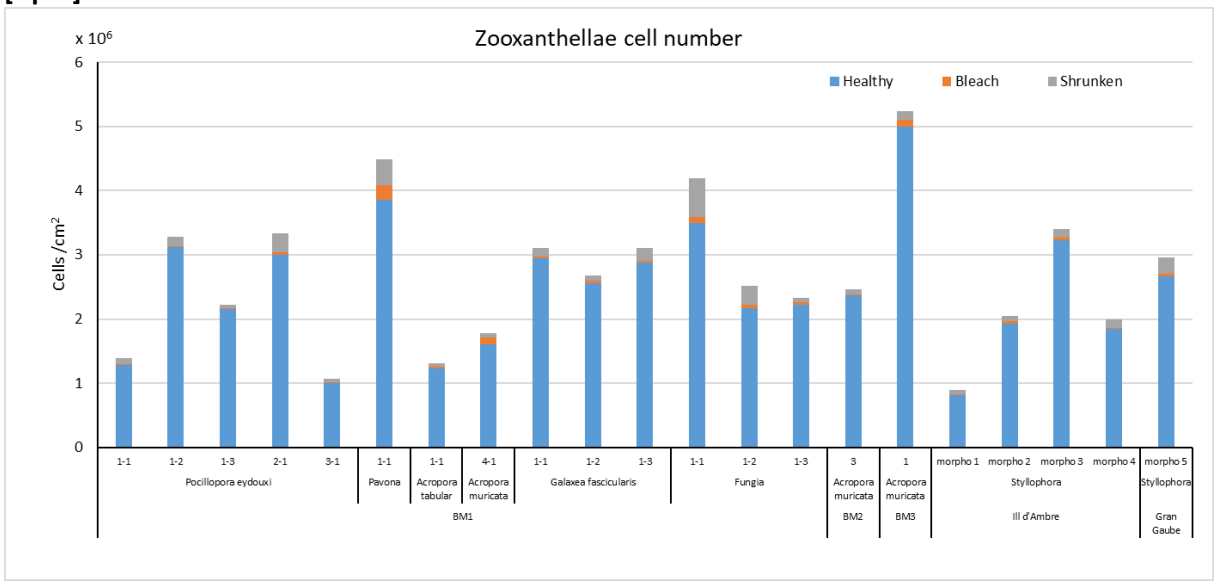


Chl-*a*, the indicator of the abundance of the endosymbiont Symbiodiniaceae, varied among species and seasons. Particularly *Fungia* kept high concentrations of chl-*a* in both surveyed seasons. Acropora muricate showed a pattern of recovery in Chl-*a* concertation from April to October

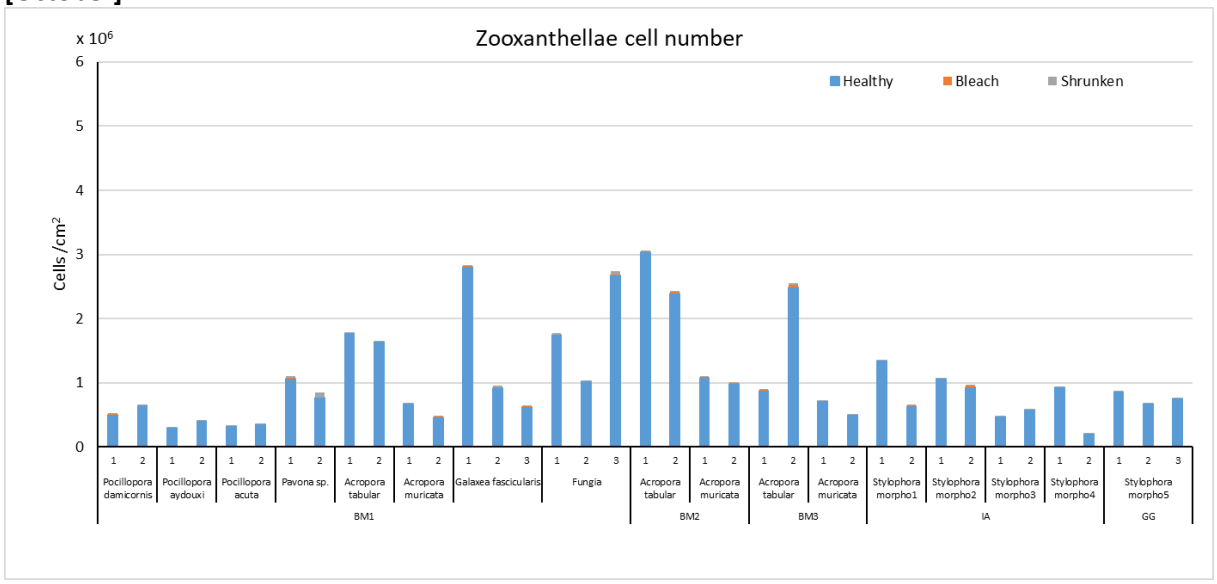
CPE, a degradation product of chlorophyll *a* which is an indicator of temperature stress, and chl-allomer, an indicator of oxidative stress, were higher in April than in October, indicating higher stress during and at the end of the summer period.

Physiological parameters of selected corals sampled in Belle Mare and Ill d'Ambre-Grand Gaube: density of the endosymbiotic algae Symbiodiniaceae and their health state

[April]



[October]



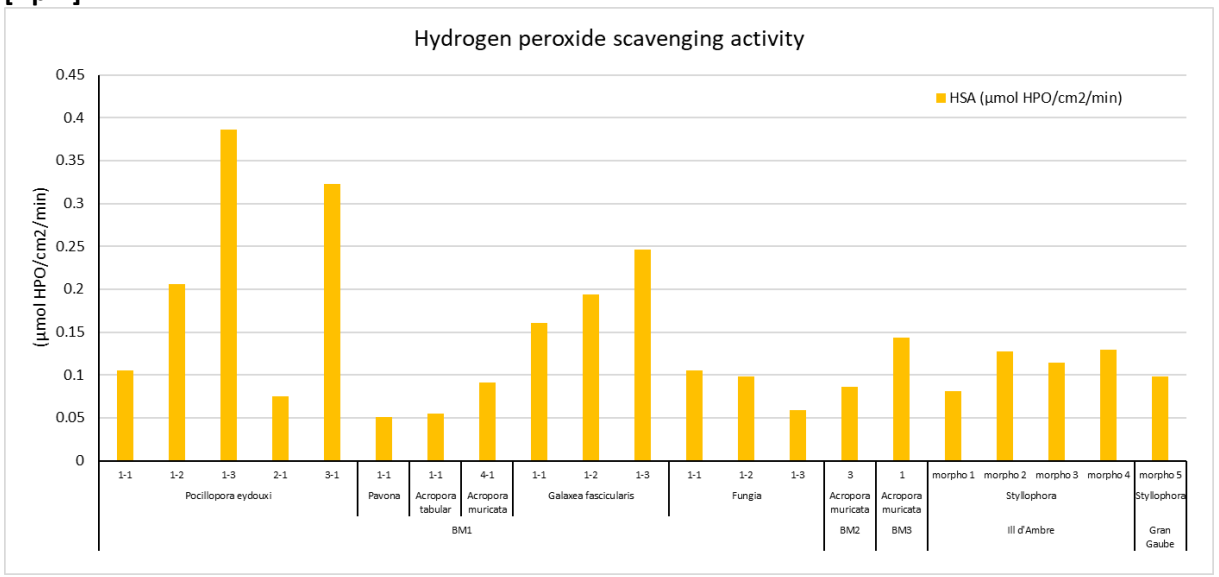
Abundance of zooxanthellae widely varied among coral species and seasons.

The overall number of zooxanthellae cells was somehow low in October, as was the percentage of shrunken cells (damaged cells that almost kept CPE but not Chl *a*). This shows that even zooxanthellae density decreased in October, their health state was better than during April under the effect of high environmental stress during the summer season

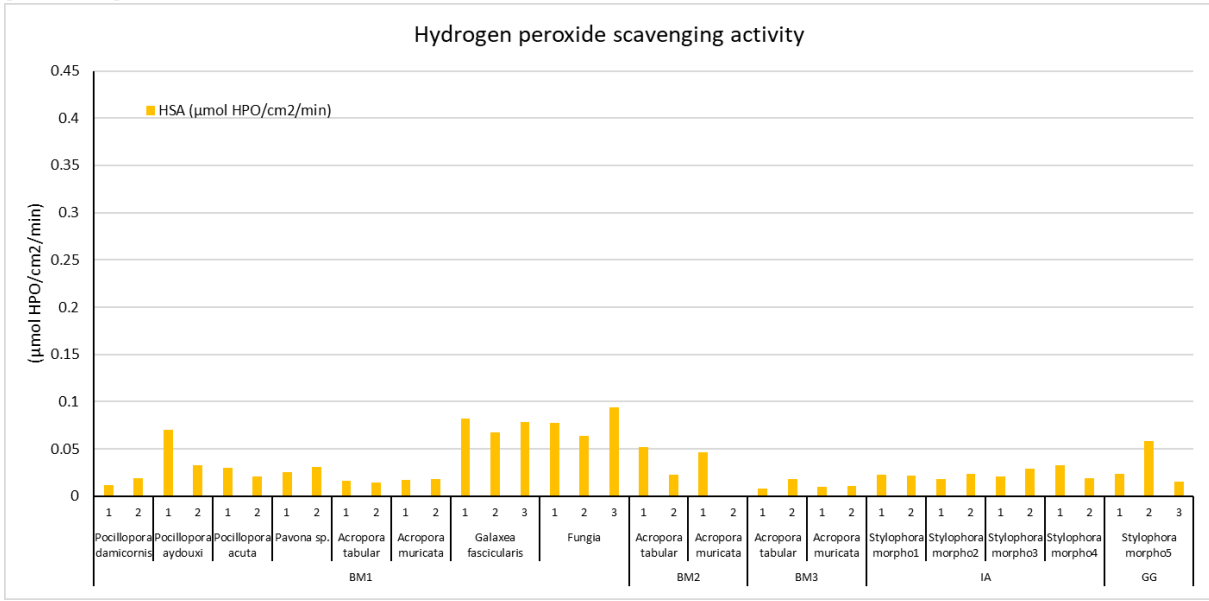
Physiological parameters of selected corals sampled in Belle Mare and Ill d'Ambre-Grand Gaube: immune response to environmental stressors

Antioxidative enzyme (hydrogen peroxide scavenging activity; HSA)

[April]

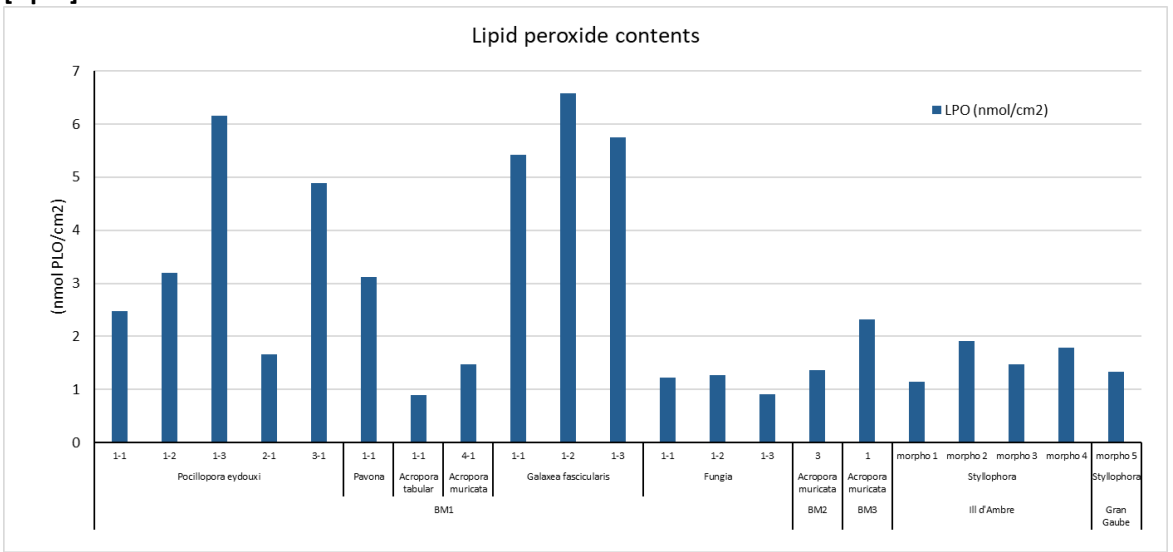


[October]



Lipid peroxide (LPO) concentration

[April]



Pocillopora and *Galaxea* actively responded to the high oxidative stress, as they produced high levels of the antioxidant enzyme HSA and kept high levels of LPO.

Comparing April and October, HSA values were generally lower in October, indicating lower stressful conditions than in April.

Corals in Mauritius show the pattern of high symbiont concentrations. We observed differences in coral responses in the two studied seasons: some corals as *Pavona* spp., *Galaxea* spp. and *Stylophora* spp. were successful in the timely production of antioxidant enzymes. *Acropora* spp. corals were sensitive to stress but showed a well recover in fall.