Institut Halieutique et des Sciences Marines

RANOMASINA

Quarterly newsletter

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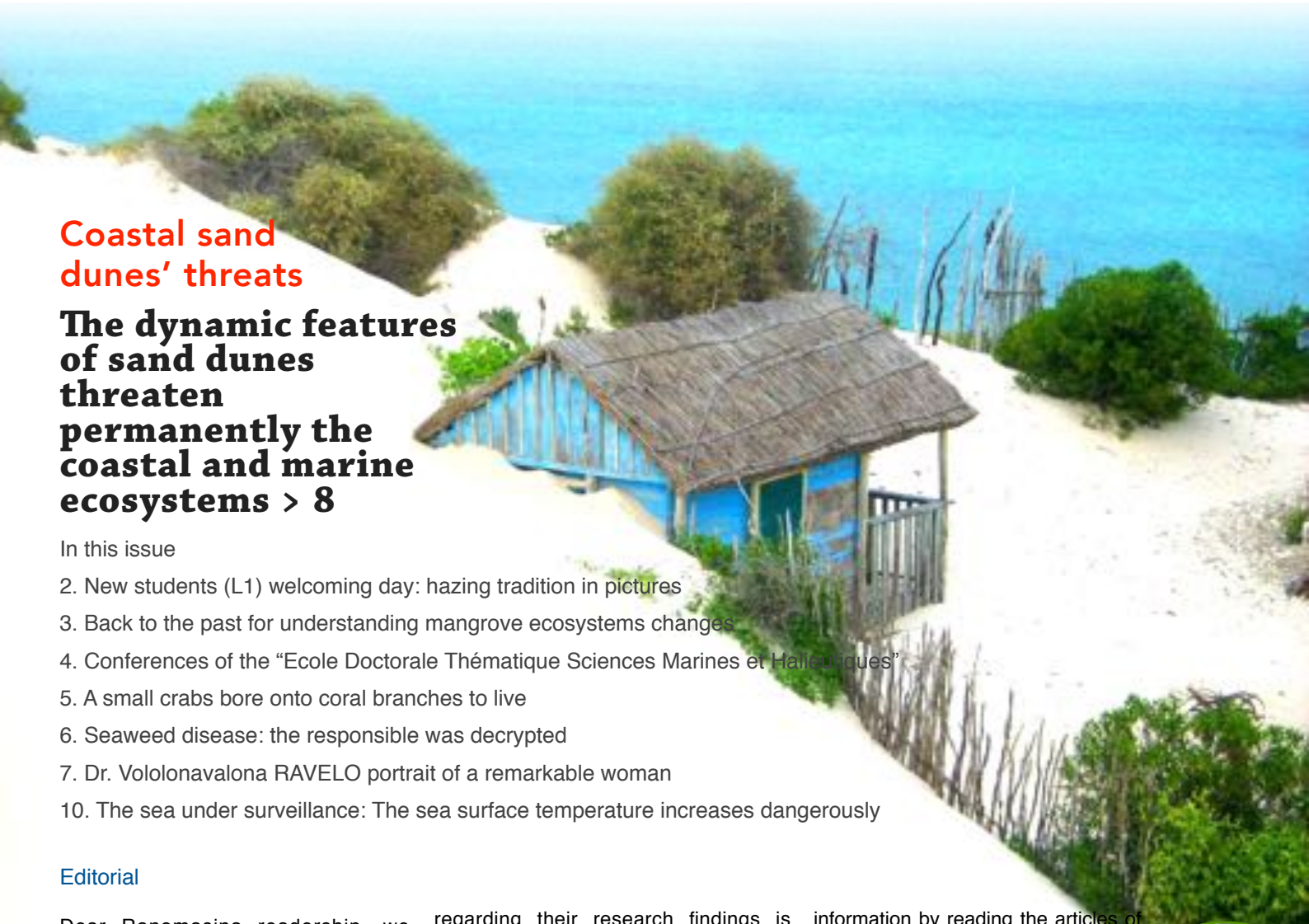
April 2016



Coastal sand dunes' threats

The dynamic features of sand dunes threaten permanently the coastal and marine ecosystems > 8

In this issue

Editorial

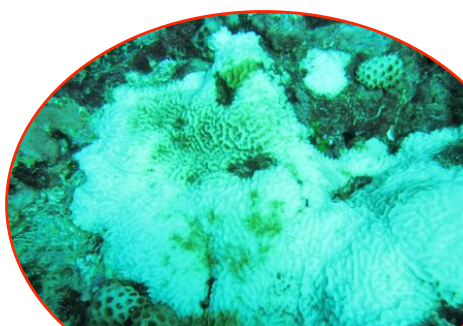
Dear Ranomasina readership, we would like to share only the good one news for you, but we have unfortunately to inform you regarding the danger occurred in our region, so that everyone should be vigilant and takes the appropriate action. The coastal dunes dynamic present a danger for mangrove ecosystems, which play an important role for the marine organisms and for the local community livelihood. Our region is still impacted by El-Nino phenomenon, the coral reef bleached due to the increase of sea surface temperature that may also increase the risk of collective intoxication due to consumption of marine animals (ICAM).

The scientists continue their research and monitoring, and further information regarding their research findings is presented in this latest issue such as: the decryption of farmed seaweed diseases in the southwest region, and the current advanced knowledge on the symbiotic crabs which bore onto the coral branches. Some promising solutions have been also proposed to overcome the wicked problems related to well-management of crab resources in Madagascar.

In this number, we will talk also about a remarkable woman, Dr. V. RAVELO for her research achievement regarding the development of Spirulina culture and also for her humanitarian and charitable action in the region and throughout Madagascar.

All of these news are presented in this issue. I invite you to discover further information by reading the articles of Ranomasina 9 for being aware of the latest update regarding climate change issue, El Nino impact, sand dunes threats, and all research findings. So, stay updated and enjoy your reading

Dr. T. LAVITRA, Directeur de l'IH.SM



… New students (L1) welcoming day: hazing tradition in pictures

From top to bottom, left to right:

1 to 4. The sea baptism begins on land

5, 6. Impregnating to various marine and coastal ecosystems

7. Welcome to the natural swimming pool, the cave Sarodrano

8. Welcome to the Tropic of Capricorn

(photos: AGE IH.SM)

Assessment of mangrove forests changes and states in the region of Menabe

Back to the past

Survey on mangrove forest was conducted in Menabe region, in the west coast of Madagascar. This study was focused on mangrove typology, floristic zonation, and the regeneration through in-situ monitoring and highlighted the dynamics and the exploitation effort of this ecosystem over 28 years (1985-2013) when analyzing the satellite data corresponding to these periods.

Mangrove population

Distribution study of mangrove composition allowed to describe its floristic zonation, but also to observe the difference of the composition of its population from the intertidal area to the shoreline. The regeneration of mangroves fringed the western coast are qualified as a good regeneration rate which is confirmed by the highest density of mangrove population under 5 cm of tree diameter.

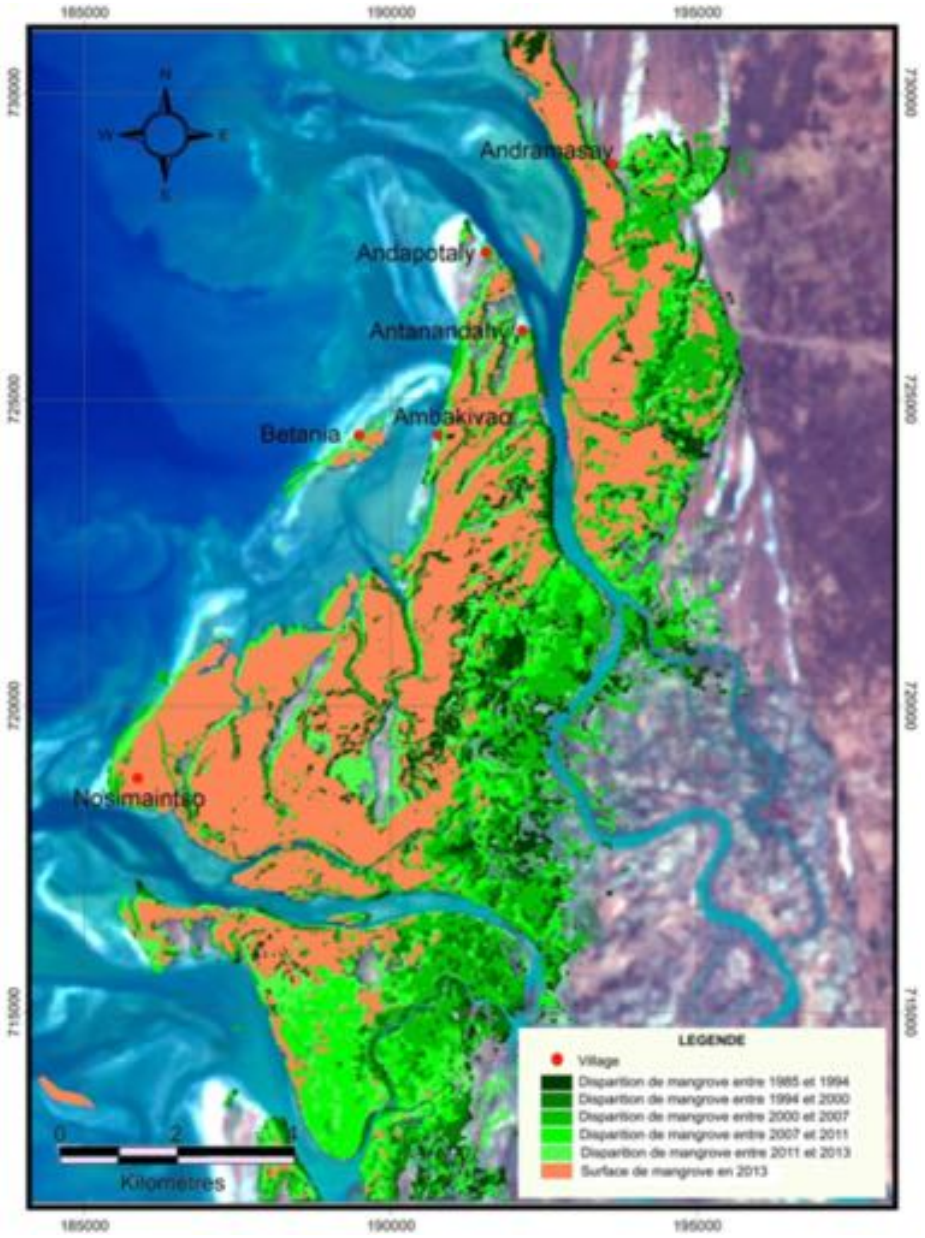
With 56.44%, regeneration is possible if mangroves ecosystem uses are handled. Biomass study conducted in Menabe revealed the highest potentiality of mangroves wood fringed the river of this region (between 105.45 and 202.47 m3 / ha), compared to coastal mangroves fringed the shoreline and intertidal area (from 55.81 to 97.60 m3 / Ha). In all the study sites, the degraded areas correspond to mangroves zone where there are an important supply in energy wood and firewood. Mangrove zones nearby villages are the most threatened by the exploitation with a high proportion of mangrove cut woods. But those, which are far from the village, are less impacted and the proportion of dead wood is important.

Information from satellite data

The satellite remote sensing data from 1985 to 2013 was computed to detect the spatial and temporal changes in mangrove cover throughout the region. In general, a negative change up to 25.01% of the mangroves cover was observed during these 18 years, with 0.89 % of surface reduction per year. However, the surface of mangrove cover was increased from 1994 to 2000 with a progression of 9.23%. From 2000 to 2013, the mangrove forest of the region was subjected to heavy exploitation, and led to the decrease of the cover percentage up to 24.12%.

D. K. RAVELOJAONA

Figure below: Mapping the mangrove changes from 1985 to 2013



Since February 2016, the PhD student of the « Ecole Doctorale Thématique Sciences Marine et Halieutiques (EDT/SMH) » of the University of Toliara organize a public conference, hosted by « Alliance Française de Toliara ». These conference series intend to share information related to their research projects, the research findings as well as the importance of findings implementation to the local public needs and to their daily life. These conferences targeted the public, the manager (NGOs, etc), private companies and the decision makers, which will use these results for promoting sustainable development of Malagasy people.

Two PhD student of EDT/SMH have launched this series of conference during the last two months. Fidèle RAKOTONJANAHARY presented his research project regarding the possibility of mangrove crabs farming, while Andriantsilavo RABARY talked about the important needs of satellite remote sensing data to address climate change issue. The abstracts of the both talks are presented below.

First conference: How to sustain the exploitation of mangrove crabs in Madagascar

Held in February 26th, 2016 at “Alliance Française de Toliara”

The exploitation of mangrove crabs known as *Scylla serrata* became an important subject in Madagascar face to the concept of sustainable use of resources and the increase of international market supply. The export of mangrove crabs of Madagascar ranged from 2 tons in 2009 to 800 tons in 2013. SMARTFISH has reported that the total export of mangrove crabs from Madagascar have reached up to 3,500 tons in 2014. The current exploitation trend threatens the population of mangrove crabs and without management measures, the stock of crab resources will decrease and the population will finally disappear. However, the potentiality of annual production of mangrove crabs is estimated between 7,500 to 8,000 tons for Madagascar. Even if management measures have been taken by the concerned Ministry by closing crab exploitation campaign during the period corresponding to adults reproduction, these resources are still threatened and subject to over-exploitation. In regards of this wicked problem, a question was raised: What other solution should be then proposed to sustain the exploitation of mangrove crabs?

Mastering crab farming from the larval stage should be a promising solution for this wicked problem.

Par F. RAKOTONJANAHARY

Moderator: Paubert MAHATANTE TSIMANAORATY

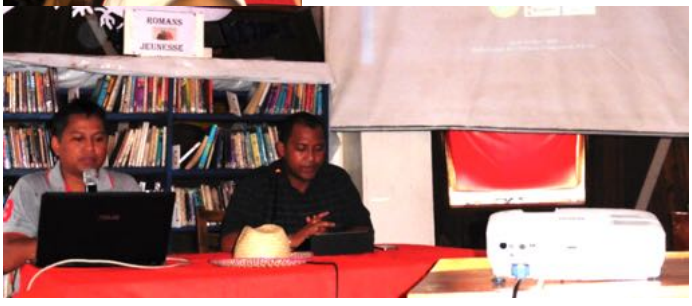
Second conference: addressing climate change issue through satellite remote sensing data

Held in March 31st, 2016 at “Alliance Française de Toliara”

New techniques and technology are currently accessible to scientists for better understanding any changes and disturbances affecting the planet. But, many constraints and impediment constrain the involvement of researchers from developing countries such as Madagascar. Nevertheless, there are many international program and initiatives enabling to monitor the climate change issue in our region. Most of the global and local data from these programs such as MESA project (Monitoring for Environment and Security in Africa: http://rea.au.int/mesa/) are free access and the data computing techniques are also provided. Currently, Madagascar can monitor the progress of climate change issue, and contribute to the development of best models to predict the future change that may occur in our planet.

By A. RABARY

Moderator: José Victor RANDRIANARIMANANA



Next conferences

April 28th, 2016: « The seahorses of the southwest of Madagascar » by Zo RASOLOARIJAO

May: « The shrimps diseases, a danger for the users? » by Maherizo TG FERNAND

Following photos (From the upper side):
1. F. RAKOTONJANAHARY gives his talk
2. The audiance is attentive
3. A. RABARY presents its findings

Photos of A. RABARY (1,2) and F. RAKOTONJANAHARY (3)

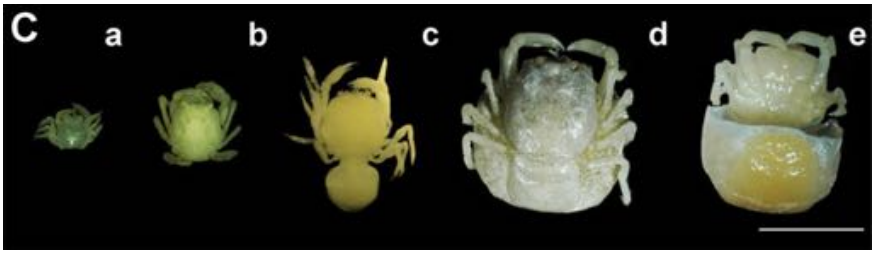
Characteristics of the association between the symbiotic coral gall crab *Hapalocarcinus marsupialis* and their stony coral hosts *Seriatopora* sp. on the Great Reef of Toliara.

Coral reefs allowing the development of thousand species constitute one of the crucial ecosystems of biosphere, which is illustrated by the large number of symbiotic interactions among the reefs. Decapods are particularly abundant in the stony corals such as crabs. The crab family known as Cryptochiridae bore into the branches of coral that causes galls development in the stony corals hosts. For the case of *Hapalocarcinus marsupialis* (crab specie), the galls development is caused by the presence of the female of this symbiotic crab specie. **This development is categorized in four distinct morphological stages** (Figure B). Galls are monopolized by these female crabs, which develop in parallel with gall development. In the early life stage of these female crabs, they are morphologically similar to male even their sizes. This development stage corresponds likely to fertilization period, when the males move from one gall to other one in order to meet the females to be fertilized. After the fertilization periods, the female development continues and a morphological change occurs: like size growth and hypertrophied abdomen forming a large pouch to allow eggs incubation. Females store the sperm in their two spermathecae while the galls are completely limited a communication to outside environment, which is only through small holes.

On the Great Reef of Toliara, up to 38% of Seriatopora colonies infested by at least one gall, with a maximum of 27 galls in a single coral colony. Despite this abundance, crab does not seem to cause any negative impact on its host. No damage and no changes were observed neither in the coral skeleton, nor in the living tissues; the abnormal skeleton development forcing corals to create the galls constitute only the main negative impact of crab presence. In addition, the results based on carbon and nitrogen isotopic signatures showed that the symbiotic gall crabs do not feed coral tissues; they feed on organic particles brought by the water flow through the small holes in the closure of gall.

All these considerations perfectly illustrate the fact that symbiosis characterization is not something well-defined, but rather part of a continuum between the different types of relationship such as parasitism, mutualism and commensalism.

L. TERRANA,
G. Caulier, G. Todinanahary, G. Lepoint, I. Eeckhaut



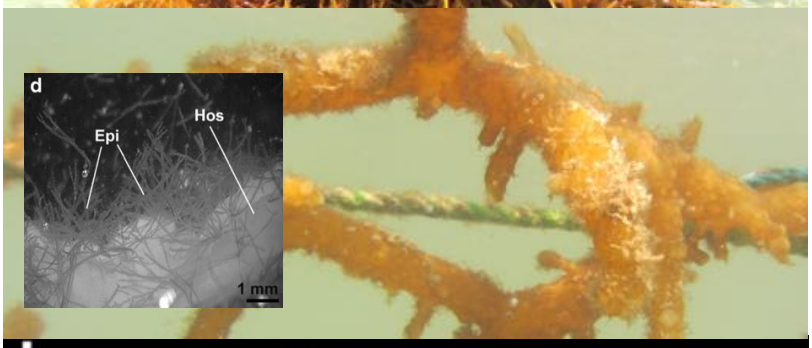
To learn more:
Terrana et al. (2016) Characteristics of the infestation of Seriatopora corals by the coral gall crab *Hapalocarcinus marsupialis* Stimpson, 1859 on the Great Reef of Toliara, Madagascar. Symbiosis

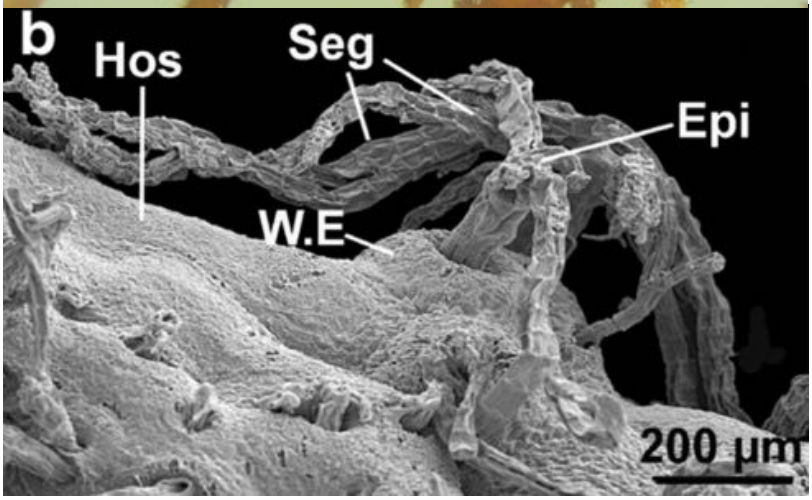
A- A colony of Seriatopora sp.
B- The 4 gall development stages
C- (a) male ; (b,c,d,e) females in different growth stages
(photos : Terrana Lucas)

Phenology of farmed seaweed *Kappaphycus alvarezii* infestation by the parasitic epiphyte *Polysiphonia sp.* in Madagascar

With the increase of seaweed farming activities (*Kappaphycus alvarezii*) for these last years, parasite algae known as “epiphytic filamentous algae (EFA)” causing seaweed disease has appeared in numerous seaweed farms in southwest region of Madagascar. The infestation of EFA has dramatic consequences for local farmers as it alters drastically farmed algal growth and has caused farming activity to collapse. The present study carried out for a period of 18 months in three seaweed farms intends to: (i) determine the relationship between Sea Surface Temperature variation and the apparition of EFA; (ii) characterize the ultrastructure of the observed stages during the life cycle of EFA and its implantation to the seaweed as a host. TEM (Transmission Electron Microscopy), SEM (Scanning Electron Microscopy), and binocular microscope were used for analyzing the ultrastructure of the cortex in infested *K. alvarezii*. These analyses revealed that EFA known as *Polisiphonia sp.* was the responsible of seaweed infestation in southwest region *of* Madagascar. Regarding the life cycle of *Polysiphonia sp.*, five stages have been observed: the infesting stage that is a small dark spot observed at the surface of *K. alvarezii*; the undifferentiated stage where individuals show normal thalli without sexual differentiation, the male gametophyte, the female gametophyte, and the tetrasporocysts. EFA infestation was never recorded in Sarodrano, but often in the two other monitored villages (Lambohara, Tampolove). However, no significant difference of the Sea Surface Temperature was detected through the three study sites. Prevalence of infestation varied from 40 to 100 % and the rates of infestation from 42 to 78 epiphytes cm^{-2}. Prevalence of infestation showed seasonal and spatial significant variation. But, no significant differences were observed, neither between sites nor with the period when considering the infestation rate. The ways of infestation between the EFA and *K. alvarezii* individuals in an infested field, and also their transmissions from infested area to healthy one are presented and discussed in the present work.

G. TSIRESY
(J. Preux, T. Lavitra, P. Dubois, G. Lepoint, I Eeckhaut)





Photos, from the top

1. Algae seine (growth monitoring, avec Jean Luc)
2. 3. Infested seaweed (EPI: EFA, Hos: Host)
4. Epiphyte clings to its host.

More: « Tsiresy et al. (2016) Phenology of farmed seaweed *Kappaphycus alvarezii* infestation by the parasitic epiphyte *Polysiphonia sp.* in Madagascar. J of Appl Phycol, DOI 10.1007/s10811-016-0813-8 »

In the occasion of the world women day 2016, ***Equitalgue Madagascar*** has honored the portrait of a remarkable, humanist and patriot woman: Dr. RAVELO (Mme Vola)

Portrait of remarkable woman

Mme Vola has completed her brilliant master study in Applied Oceanology during which she was among the marine biologists team of IH.SM that discovered the endemic micro-algae known as Spirulina. With the support of Philippe Stefanini (Experts Super-Aliments du CNRS France) and Paul Ricard Oceanographic Institute, she received a fellowship enabling her to complete her PhD work related to the culture of this micro-algae. She obtained her PhD after a long stay and hard work with international experts in microalgae in France (Prof. Ripley Fox, Prof. Nardo Vicente and Prof. Jean Paul Jourdan). And, she decided to come back to Madagascar with ...

- An ambition:
"Sharing the gained knowledge in micro-algae to the up-coming entrepreneurial-biologists"
- A dream:
"Alleviating or eradicating the problem of food insecurity in the Southern region of Madagascar which is experiencing a poor agricultural production. However, the climate condition features of this region are appropriate for the development of Spirulina cultures"

After several years of experiments during which she was experiencing different hard situation, but the exceptional conviction of Mme Vola allowed her to manage such impediment and well-conduct the urgent need of humanitarian action. In 2002, she received a support funding from “Fondation Suisse Antenna Technologies” which is a Swiss Charitable foundation for developing for the first time the farm of Spirulina production in the Indian Ocean.

In 2008, Mme Vola and IH.SM, with the support of the “Agence de la Francophonie, Madagascar”, have organized the 3rd International Symposium on Spirulina which was held in Toliara for assessing the use of Spirulina in the domains of nutrition and health. Despite the positive and promising results, their development was limited due to the absence of funding during the political crisis from 2009 to 2014.

So that, a young group that are inspired by the actions of Mme Vola were decided to accompany and help her during the political crisis period in order to prototype a viable and sustainable project that will be independent to political trouble.
That is the reason why we honor and thank Mme Vola in the occasion of the world women day 2016 for her remarkable achievement!

The adventure continues

Equitalgue Madagascar
(www.equitalgue.com)

Above: Dr. Vololonavalona Ravelo

Photos (from the top):
1. Dr. V. Ravelo with the professors-researchers of IH.SM and the both international experts in oceanography & in micro-algae : Dr R. Fox; Professor N. Vicente*

2. Dr. V. Ravelo in the point of conducting sensitization event related to malnutrition and the use of Spiruline in Equitalgue Madagascar.

3. Spirulina distribution in a clinic. Taking and consuming Spirulina of Equitalgue correspond to an active contribution to our action for fighting against malnutrition.

Update result?

Up to 16,000 people "saved" from malnutrition. 13 Spirulina producers and 31 people (23 national and 8 international) have been trained. And 13 scientific thesis (9 Bachelors; 2 masters; 2 PhDs) have been published.

The dynamic features of coastal sand dunes: permanent threat for the coastal and marine ecosystems

Dunes dynamic: globalized phenomenon

The coastal landscapes and seascapes of southwestern Madagascar are usually dominated by fishermen villages, mangrove forests, fringing reef, lagoon and sand dunes. The last one may change rapidly over short time periods when they are not anchored by vegetation which are difficult to be planted in regard the condition features of this mobile landscape. These sand dunes are typically extended across a wide area along the southwest coast from Androka (in the south) to Morombe (in the north) with different dynamic features. Some dunes destroy the coastal ecosystems such as mangroves, lagoon, fringing reefs, and act also to the village of fishermen that obliged them to move to other dwelling. The problems are strongly related to climate issue, but also linked to the loss of vegetation that weakens the dunes structures and emphasizes the movement of sand.

Indeed, dunes dynamic constitute currently a scourge for the people lived along the coast as they threaten their compounds and constrain their economic activities. (Photos 1, 2 and couverture photos)

These people that worried of their subsistence may hardly design a management measure for sustainable use of the resources. However, several environmental and development projects and programs involved in the Southwest Region, but large-scale actions with sustainable impacts are not yet palpable. One of the successful actions regarding the stabilization technique of dunes was performed in RN9 at the municipality of Belalanda. (Photo 3).

The Mangrove of Ambondrolava and Lanirano will be disappeared ?

The mangrove of Ambondrolava (in Belalanda) is an exceptional site in terms of community- based management and restoration via mangroves reforestation. This ecosystem is directly connected to the sea water by a large channel. However, the mouth of this channel is threatened and will no longer connect with the sea due to the movement of sand dunes, which are currently reached the northern part of Tsongeritelo. This situation is doubtful face to the effort in terms of sustainable management of natural resources in the area.

Dune fixation actions exist here and there, but we should globalize and focus on critical and sensitive areas to save efforts in conservation or construction already achieved with so much investment.

Photos from the top:

1. Agricultural field of Androka;
2. Mangrove of Ambondrolava;
3. Sisal plantation, in Belalanda);
4. Ipomea pescaprea (Lalanda): dead

(Photos de F. BEHIVOKE)

The mangrove of Lanirano as well as their channel (in Antsakoa), which is the unique nursery area interconnected to the complex reef and lagoon of Androka is currently experiencing the impact of dunes dynamic features (photo below). Before, the depth of the channel mouth of Lanirano mangrove was around 6m during the low tide, but currently its depth is no longer reached even half of meter. Without an urgent and sustainable action, this mangrove ecosystem will be also disappeared, like the mangrove of Fenembosa, which was completely disappeared due to lagoon mouth in Bevoalavo which was clogged by sediments in 1994.

Why sand dunes stabilization is needed?

Dunes are formed by sands accumulation moved by wind and water. This accumulation constitutes a permanent threat for the principal productive coastal habitats while vegetations which will trap the grains of sand are still missing. Dunes will never be considered as permanent features of the landscape, and will destroy the village, crop field, mangrove, lagoon, and so on. Nonetheless, the income source and subsistence of the coastal communities (fishermen and farmer) depends heavily on marine resources and agricultural crop.

F. BEHIVOKE

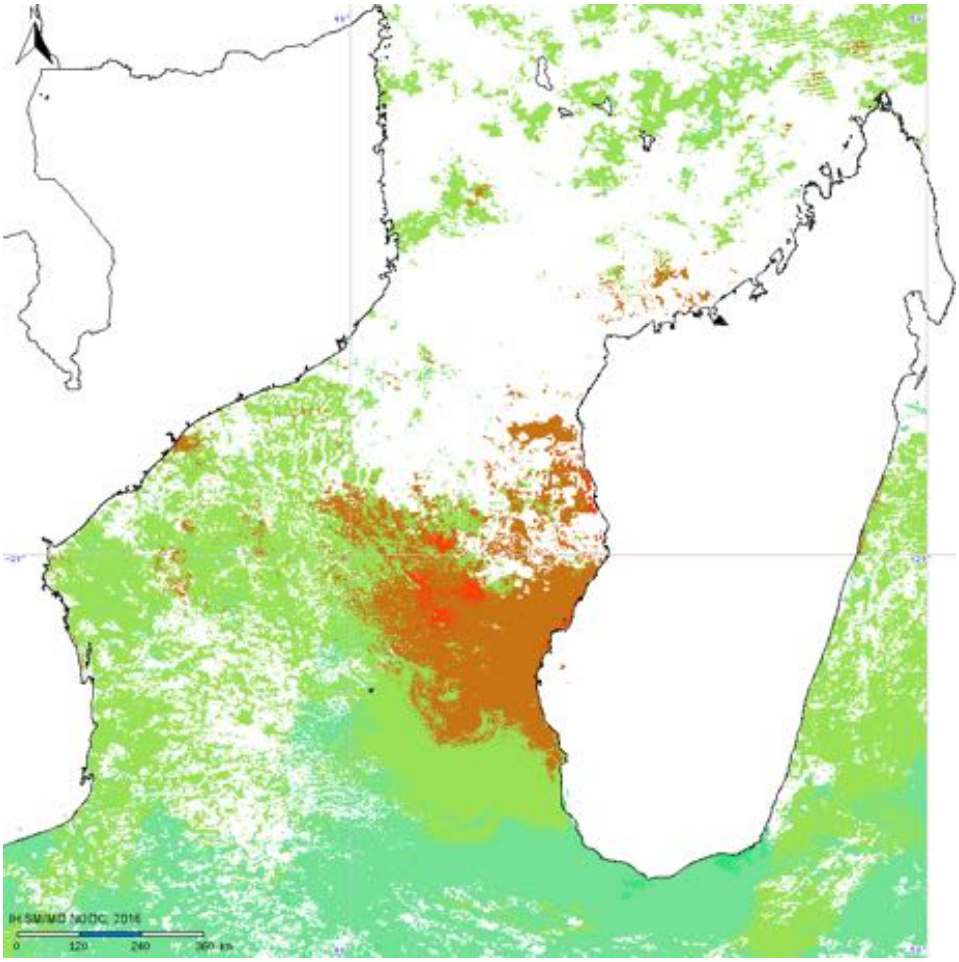
Photos from the top:

1. Dunes of Ambondrolava, channel mouth;
2. Casuarina equistifolia (Akao) and Ipomea pescaprea (lalanda);
3. Stabilization techniques of sand dunes movement in the Port of Ehoala

(Photos de F. BEHIVOKE)

Proposed solutions for sand dunes stabilizations

To stabilize the dunes, an intervention by planting vegetation in the accumulation zone is proposed to trap the grains of sand. The strategy is to mitigate the strong wind by planting the Casuarina equistifolia (Akao) and to help catch and stability of sands by planting Ipomea pescaprea (lalanda), which will act as miniature building blocks of sands. The species Casuarina equistifolia can play also the role of sand fixation like the case of Ipomea pescaprea. The native and natural vegetation plants growing in the dunes such as Zygophyllum depauperatum (Filatatao), Leptadenia sp (Taritariky) Polycline proteiformis (Ronisa / Ringadringa) should be also preserved and can be valorized to be planted in the threatened zone. We can find below an example of sands stabilization technique at the Harbour of Ehoala in Fort-Dauphin. These spatial distributions of sand dunes stabilization actions should be focused on the sensible and vulnerable areas for contributing to the preservation and conservation of coastal habitat and also for enhancing the livelihood of coastal community.



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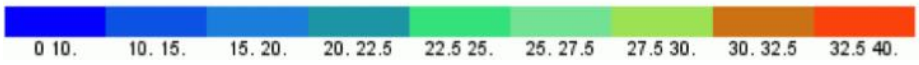
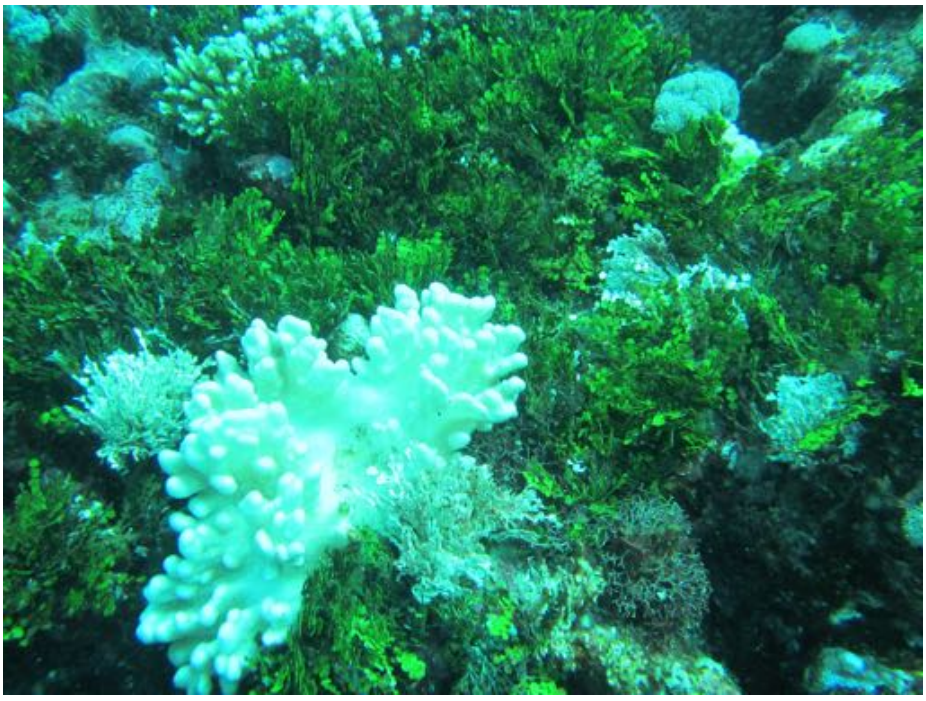




Our region is still subjected to Super El Niño impact, which increases the temperature in the coastal area. Two images from the National Oceanographic Data Center (NODC) clearly revealed that the sea surface temperature in the Southwest Region is beyond 30 °C, the highest temperature compared to the other region. And the concentration of the chlorophyll (Chl-a) is also very important in the surface.

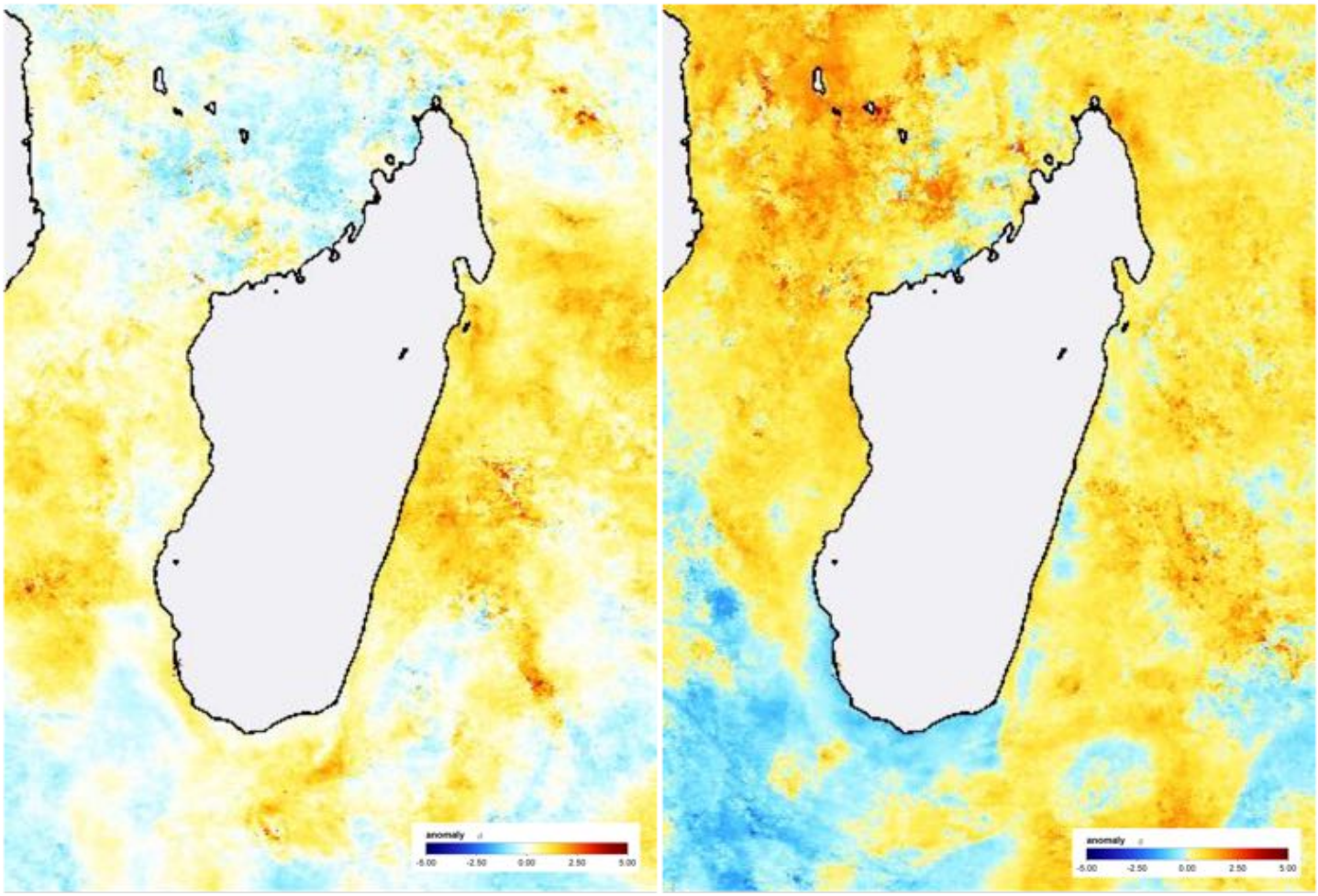
The increase of temperature is insignificant for the human population, but is intolerable for the marine organism and habitats, including corals. We need to know that corals bleaching will occur when the sea surface temperature reaches 28 ° C. if this temperature will not drop off, these small reef-building animals will die and the whole reef ecosystem will decline. And the associated animals such as fish will likely move to other places, or will disappear.

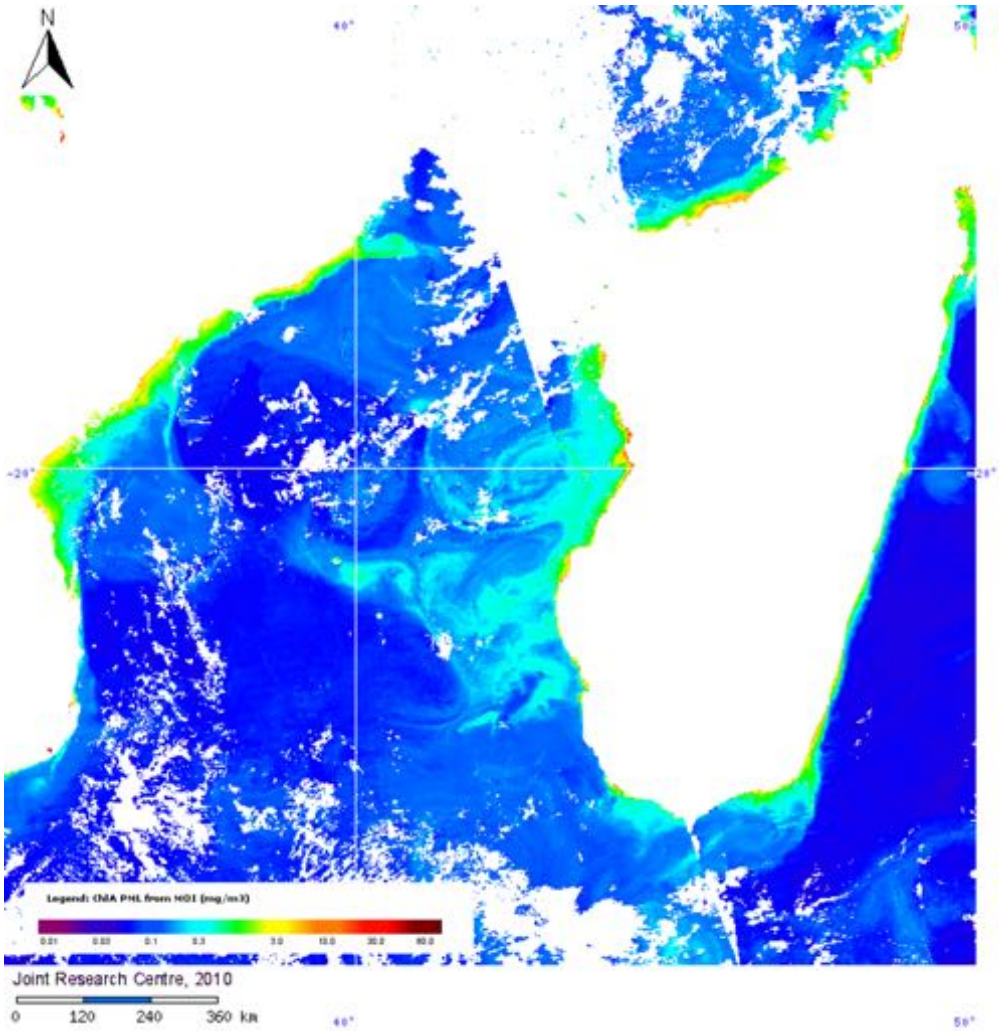
In addition, the proliferation of toxic micro-algae may be more important during the warm season corresponding to the highest value of sea surface temperature. This will worsen the risk of marine organisms poisoning and will cause the collective intoxication through marine animals' consumption (ICAM). Unfortunately, this phenomenon happens frequently in this region.

The scientists from IH.SM continue to monitor the seasonal change of the sea surface temperature and their effects on the coastal ecosystems. And they invite everyone to be always vigilant

G. TODINANAHARY
(J. Bemiasa, MW Rabenevanana, R. komeno)

^ In the upper side: Figure presented the sea surface temperature (NODC Madagascar, March 18th, 2016); below: hard corals, soft corals and bleached algae, victims of super ElNiño 2015 - 2016 (photo of R. KOMENO), Ranobe bay, Madagascar.





Images above (left to right):

1. Sea surface temperature anomaly, January 2016

2. Sea surface temperature anomaly, February 2016

< Map of the chlorophyll density (pigment in algae which also indicates their presence and abundance)

An increase in temperature may cause a toxic microalgae bloom, and can induce through the food chain, contamination of fish and other fishery products. This represents a considerable risk of occurrence of the ICAM phenomenon

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