



LEIBNIZ CENTRE
for Tropical Marine Research

ZMT



**CONCEPTS
COLLABORATIONS
COMMON GROUNDS**

**The impact of our work beyond
research and academia**

Photo: H. Reuter

Leibniz
Leibniz
Association



Photo: D. Hoeijmakers

Content



World Map **4**

Introduction:
Our impact within and beyond research **6**

Why mangrove protection counts – the **MADAM**
project in north Brazil **8**

Science as a means for advancing regional peace
and collaboration – the **Red Sea Programme** on
Marine Science **12**

Three countries, one productive ecosystem –
the **Benguela Current Convention** and its Commission **16**

Knowledge sharing on equal terms as key to
restoring Hainan’s degraded coastal areas –
the three projects **LANCET**, **ECOLOC** and **TICAS** **20**

From awareness to protection and management –
the Marine Protected Area (**MPA**) of **Pulau Pieh** in
Indonesia **24**

Academic structures for fishery management
in Papua New Guinea (**PNG**) – a joint capacity
development project **28**

Training for tropical marine research –
the **ISATEC** programme **32**

An outstanding worldwide scientific network – **ZMT’s**
alumni network **36**

Annexe **40**

World Map



8

| | |
|-----------------------------|----|
| MADAM | 8 |
| Red Sea Programme | 12 |
| Benguela Current Convention | 16 |
| LANCET, ECOLOC and TICAS | 20 |
| MPA of Pulau Pieh | 24 |
| Academic structures in PNG | 28 |
| ISATEC | 32 |
| ZMT's Alumni network | 36 |



Photos: MADAM – U. Saint-Paul; RSP – A. Genin; BCC – Benguela Current Commission; Hainan – J. Zhang; MPA – A. Kunzmann; PNG – W. Eku; ISATEC – B. Winkelmann; Alumni – D. Peterke



Introduction:

Our impact within and beyond research

For more than 28 years, the work of ZMT scientists has been inspired and guided by the institute's mission to provide a scientific basis for the protection and sustainable use of tropical coastal ecosystems. Implementing this mandate, ZMT conducts research, capacity development and consulting activities in accordance with our partners' needs and in close cooperation with international and national partners. This is how we translate societal issues into research. To be sure of fulfilling all aspects of our mission meaningfully and successfully, it is important to trace and critically reflect upon the societal impact of our activities: What difference does ZMT's work make in our partner countries? To what extent have joint efforts with our partners delivered sustainable solutions to real-world problems in the tropics? How do we want to shape our research and related activities to do better in the future?

Bearing in mind that there is no single measure of impact and thus no toolkit that can easily be applied to ZMT, we define impact as a verifiable contribution by research and research-related activities – in particular, capacity development, knowledge sharing, and consulting – to both academic discourses and societal developments. The *academic* impact of our work, by which we mean advancing the scientific understanding and explaining phenomena, and advancing scientific methods, theories, and applications within and across academic disciplines, is measured through standardised – though not uncontested – indicators, such as impact factors of scientific journals. Demonstrating the *societal* impact of research, capacity development and consulting, on the other hand, is more challenging: Such activities may have an impact on societies by altering the values, understanding, and actions of individuals as well as the norms and decisions of groups, organisations, and states, thereby initiating and promoting social, political, and economic

change. The stories told in this brochure illustrate the wide range of measures through which ZMT scientists, in close cooperation with international partners, have made a difference over the last 28 years. They range from the establishment of marine protected areas, long-standing academic structures, and academic networks in tropical countries, to the creation of sustainable settings for knowledge sharing on equal terms, and science diplomacy. National and international agenda-setting, political negotiations as well as elaborating standards and legislation are further important facets.

Our approach to analysing, understanding and demonstrating the societal impact of our activities has been inspired by the “Most Significant Change” (MSC) technique¹ which can be described in a nutshell as “a qualitative and participatory form of monitoring and evaluation based on the collection and systematic selection of stories.”² This technique has not only proven to be systematic but also sufficiently adaptable to be used in the context of development cooperation (e.g. CGIAR³ or UNICEF⁴) as well as in institutional learning in industrialised countries. Given that the MSC approach neither aims to generalise nor to quantify, we have employed an adapted version. A series of semi-structured interviews conducted with international partners and ZMT scientists on the societal impact of their projects led us to choose the impact stories presented in this brochure. These narratives illustrate the contributions made by ZMT in our partner countries: the impact of our work beyond research and academia. Furthermore, this brochure illustrates ways in which ZMT implements all three pillars of its mission: research, capacity development, and consulting for a wide range of stakeholders.

It should be emphasized that ZMT practises

1 Davies, Rick (2015). The ‘Most Significant Change’ (MSC) Technique: A Guide to Its Use”. DOI: 10.13140/RG.2.1.4305.3606.

2 Serrat, Olivier (2017). The Most Significant Change Technique. In: Knowledge Solutions, Tools, Methods, and Approaches to Drive Organizational Performance. Springer, Singapore, p.36.

3 Consultative Group on International Agricultural Research (CGIAR) impact paper series (<https://cgspace.cgiar.org/handle/10568/3622>)

4 United Nations International Children's Emergency Fund (UNICEF): United Nations Inter-agency Project toward a Resource Pack on: Research, Monitoring and Evaluation in Communication for Development (https://www.unicef.org/cbsc/index_42377.html)

a strong partnership approach, conducting research projects in close cooperation and on equal terms with its partners in the tropics. ZMT is committed to meeting the scientific and developmental needs of these countries by promoting the establishment of long-term projects based on the intensive involvement of scientific partners and the unrestricted exchange of data and information. This partnership approach is one of the success factors determining impact. It features in all the stories presented in this brochure and is firmly established and documented at the institute, for example in the *Bremen Criteria*, ZMT's *Stakeholder Engagement Guidance* and its *Capacity Development Strategy*.

Currently, ZMT has several ongoing capacity development projects that have been informed by the lessons of the impact stories in this brochure and are designed with the goal of impact in mind. One is WIOGEN (West Indian Ocean Governance and Exchange Network)⁵, a scientific networking platform and an integrative vision of social learning approaches that fosters regional ocean governance. Another is PADDLE (Planning in a liquid world with tropical stakes)⁶: It brings together internationally distinguished researchers and actors from countries bordering the tropical Atlantic and from the EU to create a network and a collaborative platform, which will build theory and methods for pertinent marine spatial planning in tropical areas ■

5 See project description on <https://www.leibniz-zmt.de/en/research/research-projects/wiogen.html>

6 See project description on <https://www.leibniz-zmt.de/en/research/research-projects/paddle.html>

"You have to try the impossible to achieve the possible." This is a lesson we have learned in our projects and that we want to pursue further to help ensure that ecosystems, international and regional actors as well as local communities benefit sustainably from ZMT activities worldwide.



Photo: A. Moesinger



Photo: U. Saint-Paul

Why mangrove protection counts – the MADAM project in northern Brazil

Mangroves are one of the most undervalued ecosystems on earth and, at the same time, one of the most threatened. The joint research project "Mangrove Dynamics and Management – MADAM" was initiated by ZMT to generate knowledge based on research and a continuous long-term survey in northeastern Brazil. The aim was to protect mangrove ecosystems and to contribute significantly to sustainable resource management.

Mangroves are found in sheltered coastal marine and estuarine areas in the tropics and are strongly linked to the region and its population – not only on an ecological but also on a social, cultural, and economic level. The mangroves' high biotic productivity delivers a variety of essential ecosystem services and functions, such as coastal protection, food security, income generation through fishery, timber and plant products as well as tourism. The mangrove crab *Ucides cordatus*, for instance,

is of major importance for local populations in northeastern Brazil. It plays an important role in poverty alleviation, because crab collectors have few other sources of income and are amongst the poorest coastal dwellers in the region. However, the intensity of human use is increasing, approaching in some cases the limits of biological resources renewal. Sustainable, meaningful and effective management strategies are not only essential for the crabs to flourish but to protect mangroves and their productive capacity for the ecosystem as a whole.

The joint research project "Mangrove Dynamics and Management – MADAM" was initiated in the Caeté Mangrove Estuary in northeast Brazil, one of the largest continuous mangrove areas in the world, in 1995. This ten-year research project funded by the BMBF was conducted jointly by scientists from ZMT, the Federal University of Pará

How the protection of a mangrove ecosystem in Brazil fosters regional self-organisation and enhances the quality of life and health.



(UFPa) and the Emilio Goeldi Museum (MPEG) in Brazil. The objectives were to predict mangrove growth patterns in the Caeté Estuary, establish the scientific principles for the sustainable management of natural resources in this region, and assess the links between economic activity, society and the mangrove ecosystem. The institutions involved not only wanted to acquire knowledge of natural processes but also of relevant institutional, cultural, economic, social and political processes.

MADAM was a programme dedicated to partnership and academic capacity development: More than 30 different stakeholder groups with varying coastal management priorities were involved, mainly local community members, scientific partners and students from UFPa and MPEG. A total of 25 doctoral theses and more than 50 Master's theses were produced and successfully defended, many of them in Brazil, and over 160 articles were published jointly in peer-reviewed journals by German, Brazilian and other scientists. Moreover, during the last 15 years, the University Campus of Bragança has developed from a teacher training college with just a few undergraduate courses into an institution with Master's and PhD programmes focussing on life science, an Institute for Coastal Studies associated with a large group from the UFPa in Belém working on genetics, and a diversity of other faculties with a total of 45 professors. MADAM functioned like a catalyst; the level of academic qualifications has risen significantly. Now, former MADAM students work in Germany, Brazil, the UK, the Netherlands, the United States, Argentina, and Peru either for NGOs, governments or in academic positions. When the project came to an end, ZMT remained active in the region, based at a jointly operated field station on the Campus of Bragança. Given the successful development of the Campus that resulted from MADAM and subsequent activities, ZMT recently acknowledged that its support →



for the field station was no longer required. Scientific and capacity development activities will continue on eye level.

A further important aspect is the impact the project has had on communities along the Caeté in raising their awareness for protecting the mangrove ecosystem. A group of Brazilian journalists published an illustrated bi-monthly journal *A Folha do Mangue* (The Mangrove Leaf) featuring MADAM-related information and general environmental topics. The journal was distributed for free and in great demand amongst school teachers. Courses on environmental issues were also offered at schools. The way in which village communities and mangrove producers, who were originally little coordinated, are now organising and running initiatives together, demonstrates how the project has empowered stakeholders to take an active part in sustainable management: Local residents in areas adjacent to mangroves, crab collectors and fishermen, honey collectors and also young researchers at the regional university have established local organisations for coastal management, including village development programmes with their own support networks involving institutes, governmental organisations, and NGOs.

The pre-requisite for all these processes was an exchange of knowledge on equal terms: Three community meetings were held to identify local problems and people's perceptions of coastal protection efforts as well as associated socio-economic strategies, including gender-specific issues. This resulted in improvements in the local infrastructure and in regional marketing: a solid-surface main road was constructed allowing year-round mobility and access to the beach village of Ajuruteua which has been able to develop into a regional tourist destination; small shops now cater for people's basic needs, and trading in mangrove products such as fish, crabs, honey, and handicrafts has expanded.

MADAM directly influenced agenda setting, policies and new standards: Community management of natural resources, known as "Reserva Extrativista" (RESEX), was adopted as an official policy in Brazil. In response to demands from traditional and indigenous communities, semi-protected areas were created in which public land was used to extract natural resources in a sustainable way.

This helped to preserve the natural environment as well as local communities with their culture and traditions, empowering them to participate in governance and steward biodiversity conservation. MADAM scientists contributed to turning the Bragança peninsula into a marine "extractivist" reserve. In Brazil marine reserves of this kind are essential instruments for both fisheries management – such as certification of origin and fair trade – and responsible tourism development. They also play an important role in integrated coastal management based on scientific knowledge, as developed by MADAM. Standards for crab fishery are one example. MADAM is a genuine model for how to develop international collaborative projects, in this case between Brazil and Germany, to achieve productive and long-lasting cooperation with a sustainable impact on the environment and society.

ZMT's long-standing activities in Brazil (and Southern Africa) made the institute a natural partner in, and contributor to, trilateral negotiations held by the EU, Brazil and South Africa with the aim of upscaling research, innovation and cooperation in the Atlantic basin. These negotiations culminated in the Belém Statement which was adopted in Salvador in July 2018. The resulting international transatlantic project AANChOR (All Atlantic Cooperation for Ocean Research and innovation) is co-headed by ZMT, which is responsible for capacity development, information and data sharing. AANChOR's main ambition is to promote the implementation of the South Atlantic Research and Innovation Flagship initiative and the Belém Statement by reinforcing international cooperation between Europe and tropical and South Atlantic countries, and by connecting with the challenges and research needs of the North Atlantic Ocean ■



Photo: U. Saint-Paul



Photo: U. Saint-Paul



Photo: C. Richter

Science as a means for advancing regional peace and collaboration – the Red Sea Programme on Marine Science (RSP)

The Gulf of Aqaba is a particularly demanding study-ground for marine ecology and governance because this ecosystem has to be understood as a whole even though it is governed by a range of social systems and national jurisdictions. The Red Sea Programme on Marine Science (RSP), which was initiated and supported by ZMT as a joint programme in this challenging region, is a stunning example of how a common interest in the environment can be successfully used to advance regional peace and collaboration.

The Gulf of Aqaba (GoA), the north-eastern arm of the Red Sea, is a unique ecosystem and an

area of strong cultural, political, religious and economic heterogeneity. Its coastline is divided between Egypt, Israel, Jordan, and Saudi Arabia, with Palestine located in the hinterland. In the mid-1990s, coral reef research became a focus at ZMT, as these ecosystems are among the most productive and biologically diverse on Earth. At the same time, they are under severe threat from environmental stress, climate change, and other anthropogenic influences. ZMT's collaboration in coral reef research with other scientists from GoA led to a joint programme on the ecology of the coral reefs lining the Gulf – the RSP. The scientific aim of the programme was to carry out



How science diplomacy and joint research have advanced regional peace and collaboration around the Red Sea.



cutting edge research in multinational teams. The ensuing projects, which began in 1995 and lasted seven years, were an outstanding scientific success story featuring unprecedented regional collaboration. More than 70 partners from Egypt, Germany, Israel, Jordan, and the Palestinian Authority were actively involved. Joint academic training and capacity development, coordinated by ZMT, was a key component and major advances were made in understanding GoA as a highly sensitive ecosystem bridging the African and Arabian plates.

RSP was unique in its aim of establishing sustainable relationships between scientists from the participating countries – playing a major role in the initiation of long-standing connections between Jordan and Israel that continue to this day. Most of the research activities took place at the Interuniversity Institute (IUI) in Eilat, Israel, and the Aqaba Marine Science Station

(MSS) in Jordan, located on opposite sides of the northern Gulf of Aqaba. On joint cruises and land-based expeditions the members formed long-lasting partnerships. Initiated by ZMT scientists, an international cruise aboard the *RV METEOR* in 1999 provided a unique opportunity to carry out synoptic interdisciplinary research on a wider regional scale.

The natural beauty of the ecological system and cultural diversity of the area offer great potential for marine-based tourism of immense economic interest to individuals and governments in the countries bordering the Red Sea. Cruises, diving, and coastal recreational activities, as well as limited fisheries, are all part of ongoing recent developments in the region. Knowledge gained through RSP and the follow-up projects has been instrumental in ensuring the protection and management of this unique ecosystem. ZMT played a major role in capacity development →



and upgrading the research infrastructure at MSS, Jordan, including setting up an aquaculture project for breeding the giant clam and recirculation facilities for growing and breeding selected species of fish.

Under the thematic umbrella of Red Sea research, scientists were asked to propose novel ideas to be included in the programme. This bottom-up approach became a key characteristic of RSP that assured excellence in both science and research. Among many others, the scientific outcomes included publications in *Nature* and *Science* and a special issue of *Marine Ecology Progress Series*. Moreover, in total, 37 M.Sc. and 33 Ph.D. theses were completed, and many former students now hold leading positions in their own countries, constituting an established, active research network. RSP has thus proven an exceptional programme for science and education and a prime example of successful diplomacy through joint research based on mutual respect and trust.

The long-term impact of RSP is also illustrated by the Memorandum of Understanding (MoU) between ZMT and MSS, recently re-affirmed in Aqaba, which was launched by a Jordanian RSP alumnus who is now the director of MSS. The MoU between ZMT and IUI was also re-affirmed at the same time. Initiated by RSP, another significant outcome is the cooperation between Palestinians and Israelis in marine sciences that continues to date mostly through El Quds University in Jerusalem. Direct collaborations with Egyptian marine scientists have been affected by recent political

developments; efforts continue in the hope that it will be possible to resume collaboration at some stage. Fortunately, joint research activities among ZMT, MSS, and IUI scientists persist in the form of individual projects with funds provided by various sources including US-AID, NATO, and the World Bank. In 2017, close collaboration between ZMT and IUI was launched in the framework of the ZMT-led Eilat Leibniz IUI Centre (ELIC), which is based on the MoU between the Leibniz Association and IUI signed in 2016. With its highly relevant focus on tourism research, the University of Applied Sciences Bremerhaven is also a partner in collaboration with RSP.

Scientific research in the Red Sea is central to understanding its ecosystems and resources, for example to better manage human activities that depend on or affect it. However, the precariousness of the region's political situation has left the Red Sea a little-researched area despite successful programmes like RSP. To promote research in the region, new and resumed cooperation between research institutions along the entire Red Sea coast is needed. Partnerships and trust are the only way to translate research in ecology and the social sciences into meaningful recommendations for sustainable coastal development and peace. RSP demonstrated that substantial political constraints do not necessarily rule out collaboration and good science, provided that the scientific partners are willing to bridge gaps, overcome barriers, and gain support and advice from partners worldwide ■



Photo: M. Wunsch



Photo: W. Ekau

Three countries, one productive ecosystem – the Benguela Current Convention and its Commission

The establishment of the Benguela Current Commission in 2007 and the historic signing of the Benguela Current Convention in 2013 represented the culmination of many years of research, collaboration and negotiation between Angola, Namibia and South Africa, supported by ZMT scientists.

The Benguela Current Large Marine Ecosystem (BCLME) extends from east of the Cape of Good Hope northwards into Cabinda Province in Angola and encompasses Namibia's entire marine area. Ecologically, this is one ecosystem shared by three countries: Angola, Namibia and South Africa. Irrespective of political difficulties hindering cooperation, regional collaboration is thus essential to ensure the sustainability of the marine environment, which is richly endowed with both living and non-living resources – from large oil and gas reserves to abundant fisheries and unrivalled natural beauty.

Back in 1993, a UNESCO delegation including the former ZMT director, Gotthilf Hempel, visited the government of Namibia. The goal was to conclude a formal agreement to promote an overarching regional vision for marine sciences, research, and management between the three countries and to introduce an ecosystem approach to cooperation on ocean governance and transboundary management of the marine environment. As envisaged, the Benguela Current Convention would ensure industrial development in an environmentally responsible manner. Angola, Namibia and South Africa would work together to protect biodiversity, maintain the integrity of the ecosystem and minimise the risk of long-term or irreversible impacts of human activities. Given the uncertainty of developments in the BCLME region, the international community wanted to provide material assistance to enable the three countries to form a partnership designed to establish and implement the appropriate framework for management actions.



Between 1994 and 2007, several regional scientific meetings were held to strengthen regional collaboration, involving stakeholders from the three BCLME countries as well as scientists from outside of Africa. Regional collaboration was formalised in 1997 by the establishment of the Benguela Environment Fisheries Interaction and Training (BENEFIT) programme, funded largely by Norway and Germany, but including many regional players in marine science. During the decade of the BENEFIT programme (1997-2007), ZMT scientists were actively involved in capacity development through workshops, dedicated training programmes focusing on fisheries and the marine environment, and scientific surveys using German vessels. The goal of BENEFIT was to promote the optimal and sustainable utilisation of the BCLME's living resources by:

- increasing knowledge of living marine resources in the BCLME;
- providing information for the management of national and shared resources;
- developing human capacity and infrastructure for marine science and technology in Angola and Namibia;
- strengthening regional collaboration at ecosystem level.

How ... national and international agenda-setting has led to sustainable large marine ecosystem management in the Benguela Current region.



The BENEFIT programme was of great value to the BCLME region, which is characterised by a sharp capacity gradient (human and infrastructure) from south to north, paired with an →

obvious willingness to share regional knowledge and facilities. Having launched BENEFIT with external funding, the countries have now claimed ownership of the Benguela Current Commission, funding operations themselves.

When the BENEFIT programme was wound up, ZMT continued its active support for the region through the Benguela Current Commission, which was set up in 2007. ZMT scientists visited the region regularly between 2008 and 2014 and attended most of the major regional and international scientific events, offering advice on research agenda setting and contemporary emerging marine environmental issues.

Transparency is key to acceptance. Structures were therefore established that enable business, science and industry to work together. At national level, a Namibian advisory council, embodied in Namibian law and consisting of scientists and managers from industry and labour unions, advise the Minister of Fisheries and Marine Resources on conservation and management measures such as annual harvest levels or total allowable catches for major, commercially important fish resources. At regional level, Benguela Current Commission has three statutory committees which have their roots in the BENEFIT programme and the regional working groups on fisheries, environment and capacity development. Eminent natural and social scientists as well as managers from different fields are represented on these committees, working on a variety of topics related to the marine environment and marine sectors.

Many more examples of sustainable impacts on the region resulting from the programme and cooperation could be cited. Project outcomes have been translated into sustainable use of living marine resources in the BCLME region whilst the Benguela Current Commission's annual newsletters and the information on its website have raised awareness. Although the Benguela Current Commission is not widely known across the member states, the relevant stakeholders like fisherman and industry representatives are well acquainted with it.

Looking back on its more than 25-year history, the initiative in the BCLME region can be seen as a model approach that could be applied to many other large regional marine ecosystems world-

wide. The Benguela Current Convention is now an established functional entity meeting societal challenges, such as the alleviation of poverty and sustainable livelihoods in the region, by maximising benefits in respect of goods and ecosystem services. Nonetheless, a shortage of financial and human resources remains a challenge.

Coordinating regional collaboration forges collective action plans and enlists the support of different stakeholders with otherwise very different expectations like coastal developers, coastal communities and NGOs from different sectors such as fisheries, energy and mining, environment, marine transport, and tourism. By offering advice, capacity development and joint regional research, ZMT scientists have substantially contributed to establishing an institution for collaboration in the BCLME region and helped to create the scientific basis for sustainable ocean governance and transboundary management ■



Photo: W. Ekau



Photo: H. Reuter



Knowledge sharing on equal terms as key to restoring Hainan's degraded coastal areas – the three projects LANCET, ECOLOC and TICAS

Since 2006, ZMT has been studying the transition of the coastal area of Hainan from a natural to an anthropogenically modified state. The three joint projects demonstrate the way research is being designed to maximise impact by establishing knowledge sharing, networks, and relationships as well as by involving the general public.

The study of coastal systems is particularly demanding as they involve not only the complexities of natural systems but also a vast range of human interactions. Historically, coastal regions are preferred sites for human habitation and tend to be heavily populated centres of vigorous economic activity. As a result, coastal ecosystems are strongly impacted, being in many cases irre-

trievably degraded. Hainan is the largest Chinese island in the South China Sea and the largest special economic zone in China. Its coastal ecosystems with coral reefs, mangrove forests, sandy beaches, rocky shores, and seagrass beds boast enormous marine biodiversity, but extreme weather events and human activities like tourism, aquaculture and overfishing have enormous environmental impacts, such as the depletion of local natural resources, pollution and waste problems. Coastal areas as a whole can therefore be seen as overstressed systems and their ecosystem services as severely impaired.

Coral reefs, in particular, were already in a bad state when Chinese scientists visited ZMT in 2005.



Photo: T. Jennerjahn

How elaborate settings for knowledge sharing on equal terms facilitate sustainable protection of Hainan's degraded coastal areas.



Their aim was to discover why the health of their coastal ecosystems was so poor. This question became the point of departure for cooperation between German and Chinese partners in three successive projects:

- *LANCET* project (2006 - 2011): Land-Sea Interactions in Coastal Ecosystems of Tropical China: Hainan
- *ECOLOG* project (2015 - 2018): Environmental change affecting Coastal ecosystems of tropical China during the Anthropocene: Landward vs. Oceanic influence
- *TICAS* project (2017 - 2020): Tackling environmental change Issues of China's coastal Aquatic Systems: Networking, capacity development, and knowledge exchange

All three projects seek to generate and disseminate comprehensive knowledge to solve environmental issues and to make recommendations to regional decision-makers both on protecting the integrity of Hainan's coastal ecosystems and on establishing sustainable management of Hainan's

coastal resources. The knowledge acquired is particularly relevant at local level – for sustainable aquaculture or correct municipal sewage disposal. Most of the recommendations on the proper management of aquaculture facilities, controlling aspects of overfishing and destructive fishing methods, restoring mangroves, and the sustainable use of natural resources have been implemented. The tools and advice ZMT provided have helped to halt the loss and degeneration of the coral reefs; coastal areas are recovering.

The sustainable management of coastal resources not only depends on scientists providing sound scientific knowledge but also on the actions of stakeholders and policymakers whose behaviour can have a significant impact on managing coastal resources. The relevant stakeholders in Hainan come from different groups – ranging from the general public to scientists (several European and Chinese universities and research institutes), NGOs, local policymakers (provincial departments and the German Ministry), as well as aquaculture companies. To agree on →

common interests is particularly challenging, although indispensable for sustainable collaboration. In most cases, communication, which can support the transfer of scientific results to the policy level, is the key. Policy briefs and papers that decision-makers and the general public can easily comprehend are an integral part of the project strategy. And this strategy has proven effective: In Hainan, recommendations ensuing from research projects were used to set environmental standards for water quality which may ultimately contribute to enhancing the well-being of regional communities.

Citizen Science projects on seagrass monitoring in collaboration with local NGO partners attracted a great deal of attention. They led to intensified dialogue and collaboration at local level and enabled local communities to collect and utilise useful information for the ongoing management and protection of important marine resources. Successful workshops were held involving more than 60 participants from politics, authorities, companies, NGOs, and science. Student exchange and training for individuals – technical, analytical and in the field – are establishing a profound, sustainable knowledge base and expertise in personnel development.

These knowledge-sharing activities have increased awareness of the environmental issues affecting coasts in a variety of sectors beyond the

circle of original collaborators. Together with the local partners, the results of some research projects were integrated into campaigns, the media reported the findings, and civil society started participating in the conversation on the problems Hainan's coast is facing. Such a broad range of activities facilitates much more direct access to society and ensures that research results are more easily transformed into beneficial impacts on society, the environment and livelihoods.

When both the relevant stakeholders and the general public are aware of the urgency of protecting an ecosystem, and solutions are being offered, good foundations for positive change have been laid. In Hainan, engaging with the public, networking and on-site workshop activities have helped to reach precisely that point. Thanks to ZMT's work in partnership with local actors, the awareness of Hainan's general public and decision-makers about the urgency for marine conservation has increased significantly (e.g. media coverage). Driving these activities professionally and strategically with the appropriate financial and human resources for networking and capacity development is central to successfully solving environmental problems in China's coastal ecosystems ■



Photo: I. Nordhaus



Photo: U. Krumme



Photo: A. Kunzmann

From awareness to protection and management – the Marine Protected Area (MPA) of Pulau Pieh in Indonesia

More than 55 different fish species and some 23 coral genera live in the Marine Protected Area (MPA) of Pulau Pieh in western Indonesia – a telling example of a scientific endeavour with long-term benefits for society and the ecosystem.

Numerous reefs fringe the hundreds of small islands off Padang. Until the late 20th century, they boasted a great variety of coral formations and were home to large populations of fish and invertebrates. But due to fishing with explosives, pollution, and increasing tourism, the coral reefs between the islands were gravely damaged in the 1990s. In the last couple of decades, hundreds of square kilometres have been destroyed, leading to increasingly large areas of coral rubble deposits. ZMT scientists soon urged for the establish-

ment of a Marine Protected Area (MPA) to cover thousands of hectares of offshore waters in the West Sumatra province of Padang. The rationale for this endeavour was to achieve sustainable fish management, biodiversity conservation, and the protection of natural as well as cultural resources.

The first step was to establish a joint marine biology and coral studies degree programme involving ZMT scientists at the local University Bung Hatta. This academic structure was necessary, on the one hand, to train students in academic, practical and technical courses and to inspire the next generation of researchers. On the other, it was needed to gather relevant information on the condition and ecophysiology of the reefs. The research results have informed the

scientific basis for protection measures as well as the sustainable exploitation of the area, while a series of international students' theses and publications document the changing environmental conditions and the ecology and physiology of corals and fish. Two local universities (Bung Hatta and Andalas) supervise theses in marine-related areas written by national and international students. The process of establishing the MPA was covered by the media; the university produced teaching manuals for schools and kindergartens, and some of the scientists involved held public talks to engage the general public.

In order to embark on establishing an MPA it is crucial to identify all stakeholders, including commercial and recreational fishers, divers, environmentalists, and other concerned citizens, and ideally, to involve them in the decision making and possibly the management process. In this way, the socioeconomic aspects of establishing MPAs, which often determine success or failure, can be considered along with the ecological factors. When fishermen are excluded from MPAs and their access to fishing grounds is restricted, their incomes decline. It is therefore imperative for policymakers to inform them about the long-term advantages of sustainable use. The

MPA Pulau Pieh is a prime example of how collaboration between institutions and stakeholders can lead to success. Cooperation between the Indonesian Navy, Bung Hatta University, ZMT, the local government and the non-profit organisation (NGO) *Sanari* led to the confiscation of vessels that were repeatedly caught fishing with explosives, and the imprisonment of blast fishers. This all helped to establish the MPA. Several newspapers reported on the collaboration, supporting protection of the coral reef and leading to increased civil awareness for coastal and environmental issues.

Having created a scientific basis for protecting Padang's ecosystem, the actual establishment of the MPA took five years. Many small surveys using local boats and a large exploratory cruise with the Thai vessel *Fantasea* in 1995 were needed as well as the support of the German Embassy in Jakarta. Inaugurated in 2000, with an area of 40,000 ha, the Pulau Pieh MPA was the first MPA in western Indonesia. Over the years, joint efforts by the local university, the NGO *Sanari*, and ZMT led to the allocation of funding to support reliable management of the MPA. In 2009, the newly established Indonesian Ministry for Marine Affairs and Fisheries (MMAF/KKP) provided additional funds for a permanent office, patrol boats, and a PR budget. The Pulau Pieh MPA was thus finally established and the area efficiently protected. →

How a marine protected area in Indonesia covering 40,000ha with over 55 different fish and some 23 coral species guarantees sustainable ecosystem management and reliable employment for locals.



Photo: A. Kunzmann



Local communities and fishermen as well as other stakeholders and partners, marine science teachers and students have benefitted from these developments. Thanks to the Pulau Pieh MPA and its activities, many locals have found employment – either at the MMAF or in international NGOs like *LINI* and local NGOs like *Sanari* with its dive centre. Other long-term impacts include the establishment of regular surveys of coral reefs within and close to the MPA, data collection and processing, reports on the most important findings with summarising graphics, and a twitter account with more than 600 followers, reporting on marine conservation in Indonesia.

Since the resources in the MPA have been protected, coral and fish diversity has started to recover. Fish and coral larvae from Pulau Pieh have been found outside the area, increasing diversity in the entire region. This spillover effect on adjacent marine areas is of huge value to the communities whose livelihoods depend on tourism and fishery.

To document and secure the positive impacts of the Pulau Pieh MPA, it was necessary to build understanding of policy issues and to engage in political negotiations and agenda-setting processes, board discussions and informal information transfer. On the decision-making level, ZMT scientists, therefore, highlighted the importance of protecting as well as managing the MPA to politicians, companies and international organisations. By involving the German Embassy in Jakarta, the Governor and the MMAF, new standards for regular monitoring and reporting were established for the MPA. A Governor's decree and a final national decree paved the way for positive changes in legislative processes and regulations. And, most importantly, as a result of the MPA being protected and managed by local authorities with across-the-board support, corals and fish have a good chance of staying healthy in the future ■





Photo: A. Kunzmann



Photo: W. Ekau

Academic structures for fishery management in Papua New Guinea – a joint capacity development project

Fishery management in Papua New Guinea is sustainable and profitable for the whole region thanks to long-standing academic structures that equip aspiring fishery managers, policy-makers and entrepreneurs with sound scientific knowledge and practical know-how.

Commercial and recreational fisheries, aquacultures and the exploitation of living aquatic resources make a significant contribution to the economy of Papua New Guinea (PNG).

From the 1970s, governments and aid donors launched projects to provide infrastructure,



How long-standing academic structures assure sustainable, profitable, regional fishery management in Papua New Guinea.



equipment, and training for rural fishers to kick-start commercial food fisheries. Most of these activities, however, collapsed soon after the government or the funding agencies withdrew their support, either because the fisheries were not usually profitable without high external input, or due to a lack of knowledge about fishery management. Especially small-scale fishers have great difficulties in accessing the relatively abundant offshore fishery resources economically.

Hence, in 2005, at the request of the local university in Rabaul on Papua New Guinea, ZMT scientists started to build an academic structure

for a degree course in "Sustainable Fisheries and Marine Resources Management". Based on a fishery development project run by the "Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ)", the programme was developed in cooperation with three PNG institutions: Papua New Guinea University of Natural Resources and Environment (formerly University of Vudal), the National Fisheries Authority (NFA), and the National Fisheries College (NFC). The goal of this ambitious joint project was to bring the benefits of teaching, research, technology transfer and service to the Pacific Rim Community, providing core training in fishing and seafood handling as well as expanding into aquaculture and community fisheries. Together with their project partners, ZMT scientists began by establishing a network engaging key local stakeholders from different sectors and from all levels. This was a very important prerequisite because coastal communities have the ultimate mandate when it comes to managing coastal fisheries quite apart from important knowledge and skills. To build knowledge and capacities in fisheries management, an academic curriculum for a complete diploma programme was set-up by ZMT scientists working very closely with experienced local teachers who were hired as lecturers. At the end of the ZMT project in 2009, the structures were firmly in place, the curriculum →



was well established, and students showed great interest to enrol in the programme. ZMT handed over both responsibilities and teaching materials to the local teachers and professors. Teaching continues today with 14 practical courses as well as academic courses on fishing: "Operations and Gear Technology", "Aquatic Ecosystems" and "Business and Management".

The academic programme was designed to ensure sustainability in fishery management and to develop capacity in PNG's fishery catch and processing industry as well as in administration. To ensure that it would continue, infrastructure was enhanced, and aqua-culturing facilities were built for teaching that served as a model for sustainable implementation in the field. The curriculum combines state-of-the-art scientific knowledge with traditional local know-how. To put the newly established structure on solid footing, a Memorandum of Understanding was drawn up and ratified by all stakeholders involved.

The first group of 20 students enrolled in 2006; 15 of them successfully completed their university degrees in 2008. The 14 cohorts since the beginning of the programme have seen more than 400 students participating and graduating in the

degree programme in "Sustainable Fisheries and Marine Resources Management". Today, they hold leading positions in industry, government, science and NGOs or apply the knowledge they have gained in the provincial fishery business, contributing to the sustainability of both the fishery sector and management in Papua New Guinea ■





Photo: U. Krumme



Photo: T. Jennerjahn



Training for tropical marine research – the ISATEC programme

“International Studies in Aquatic Tropical Ecology (ISATEC)” is a Master's programme designed to qualify young professionals to pursue research and practical work related to the management and conservation of tropical aquatic ecosystems and their resources. The underlying concept and course contents have been adopted by several partners overseas. Many of the 315 graduates now work in key positions at home or abroad.

In the early 1990s, some of ZMT's partners abroad repeatedly asked the institute to develop an international Master's programme to enhance the training opportunities for their young scientists. At the same time, the Bologna Process had been launched in Europe, and the European Union (EU) was funding projects in “academic capacity development.” These two circumstances enabled researchers at ZMT to establish a scientific programme combining high-level academic capacity development in tropical coastal management with an interdisciplinary, intercultural learning focus.

The programme goals were:

- to qualify young researchers from tropical countries to work in the environmental or fisheries sector in their own countries, either in local and international non-governmental organizations (NGOs) or in governmental institutions with the aim of advancing the management of their coastal areas and resources;
- to level up the qualifications of students from different countries and academic backgrounds to facilitate more balanced collaborative projects between their own institutions and other institutes.

In 1999, the ISATEC Master's programme was established in collaboration with the University of Bremen and other key actors in marine science worldwide. Partners from India and Fiji, for example, participated in teaching and supervising students' theses. From the beginning, the →

Where do ISATEC Alumni work



How ... a Bremen-based joint M.Sc. programme qualifies graduates to work in key positions all over the world.

German Academic Exchange Service (DAAD) supported ISATEC by granting scholarships for participants from developing countries; in addition to excellent English language skills, candidates must also have professional work experience, which greatly diversifies the student cohort. The programme starts with one year of teaching in Bremen followed by one semester at a partner university in a tropical or subtropical country. During this period abroad, students conduct fieldwork and data collection as part of a research project preparing for their Master's thesis. The final semester is spent completing the thesis back in Bremen. On the one hand, the applied research projects offer foreign and German participants the opportunity to learn in the field. On the other, the projects themselves benefit from the commitment of young scientists who not only contribute what they learn in Bremen, but also traditional knowledge and personal experience from their own countries.

The ISATEC programme has enabled ZMT to make an impact worldwide: Together with the University of Bremen, it provides excellent interdisciplinary and intercultural training at Master's

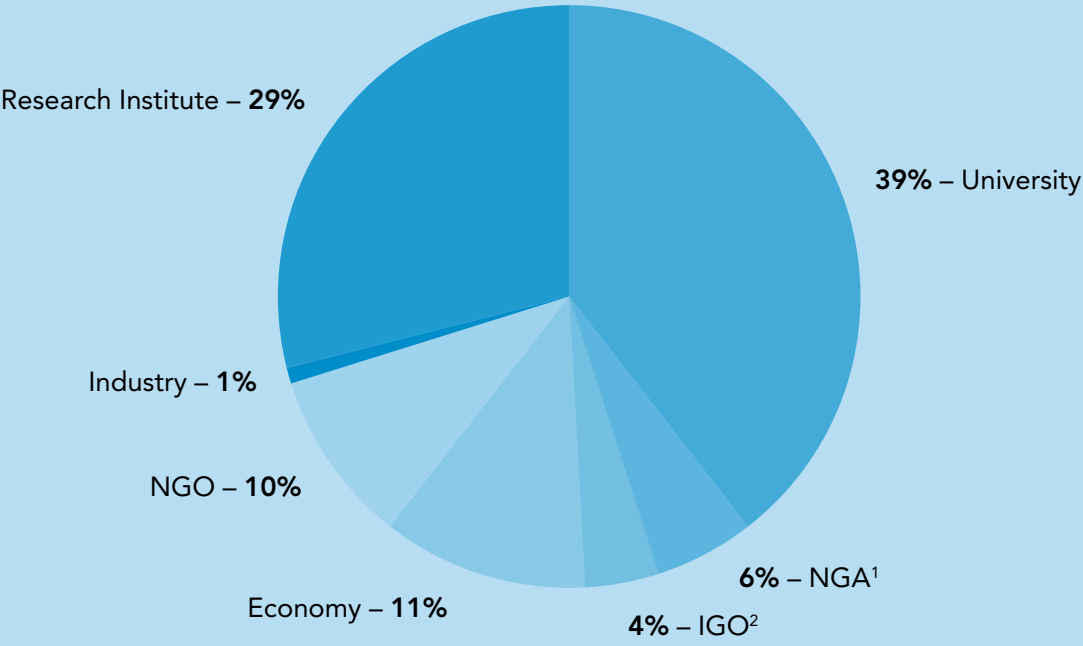
level in the field of tropical aquatic research whilst undertaking the relevant interdisciplinary research. ISATEC alumni stay in contact with the institute through the ZMT alumni network and some are ZMT Alumni Ambassadors. Thanks to ISATEC, ZMT's alumni network has grown enormously and spread around the globe, offering great opportunities to find partners for planning collaborative, international research projects and to share relevant scientific information. Due to their connection with ZMT, several ISATEC alumni continue sending students to ZMT and participate in joint research projects.

Many hold influential political and other key positions in their own countries where they can influence the governance of their coastal areas and resources. A significant number of graduates (25% – 30%) have gone on to do doctorates in Bremen or elsewhere. Several exciting research projects originated in ISATEC and raised a lot of public awareness at many symposia, workshops, and courses abroad. The programme is consequently known at many research institutes and universities worldwide and has encouraged new partners to reflect on capacity development ■



Photo: T. Vierus

In which sectors ISATEC Alumni work



¹National Governmental Agency
²International Governmental Organisation



Photo: B. Winkelmann

An outstanding worldwide scientific network – ZMT's Alumni Network

Since the establishment of ZMT in 1991, its Alumni Network has grown to more than 800 members from the tropics and across the world. Some 180 doctoral students from over 50 countries have been trained and supervised by ZMT scientists; more than 300 students have completed a Master's degree, for example in "International Studies in Aquatic Tropical Ecology (ISATEC)", which ZMT has offered in collaboration with the University of Bremen since 1999.

The ZMT Alumni Network not only comprises former doctoral candidates, Master's and undergraduate students supervised by ZMT staff, but many international fellows, students and visiting

scientists who have spent time at the institute in the past two decades thanks to grants from the NAM¹ Fellowship Programme, DAAD², Humboldt Foundation³, and other funders.

For the last 28 years, ZMT has pursued an open-door policy. Its Alumni Network is the living proof of the enormous impact it has had on academia and society through education and capacity development both on an individual and on an institutional level. Around 75 percent of ZMT alumni are based at a university or research institute. Some 15 percent work for governmental agencies and ministries and about five percent are employed by NGOs. Many alumni have

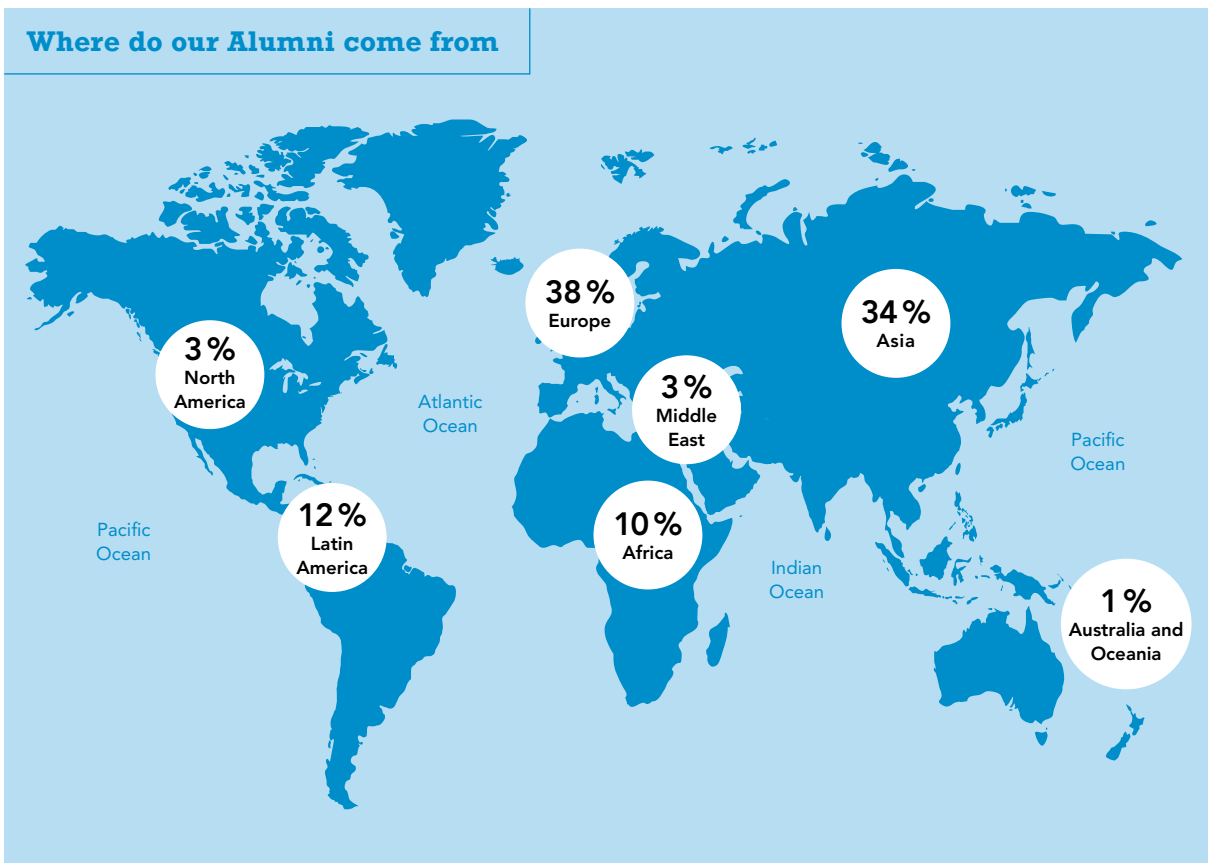
1 Centre for Science and Technology of the Non-aligned and Other Developing Countries (NAM S&T Centre) (<http://www.namstct.org/>)
2 Deutscher Akademischer Austauschdienst / German Academic Exchange Service (DAAD) (<https://www.daad.de/en/>)
3 Humboldt Foundation (<http://www.humboldt-foundation.de/web/home.html>)



How an alumni network provides role models for the next generation of researchers and drives scientific achievements worldwide.

benefitted from experiencing applied research at ZMT and within its network and are now working outside academia. Although they work in different fields and various positions, they all help to foster excellent marine research as well as marine conservation and the sustainable use of our oceans. We are thus proud that our alumni also serve as role models and mentors for current and future students.

ZMT is very grateful to its international colleagues, graduates and visiting scientists for all the efforts they make to support this outstanding scientific network. The ZMT Alumni Relations Officer actively drives and coordinates this professional network and nurtures its connections to ZMT. International and regional alumni events have sparked new collaborations, such as research proposals, and knowledge sharing amongst ZMT alumni and beyond.



Portraits of ZMT Alumni and Ambassadors



Robert Eliakim Katikiro, Tanzania

Lecturer and Head of the Department of Agricultural Economics and Business at the University of Dar es Salaam

What was your position at ZMT?

I was a doctoral student at ZMT in the Department of Social Sciences (WG Social-Ecological Systems Analysis) with financial support from the Evangelisches Studienwerk e.V Villigst and the Prince Albert II of Monaco Foundation (IPCC grant). My dissertation was about reef fisheries, livelihoods and adaptation to environmental change. Before starting my doctoral studies at

ZMT, I was a student on the ISATEC Master's programme, financially supported by the DAAD.

What do you remember about your time in Bremen?

My vivid memories of the time I spent in Bremen include the Christmas party organised by ZMT every year, social interactions, especially religious gatherings in the city, and football matches with Werder Bremen.

How did you profit from your time at ZMT?

Still being in contact with ZMT has facilitated collaboration and information sharing. There are plans for developing a joint proposal and even supervising students.

What happened once you left ZMT?

Immediately after finishing my doctoral studies in 2015, I returned to my home country, Tanzania, and resumed my position as a marine conservation manager at the Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP). That same year I changed my job and joined the University of Dar es Salaam as a lecturer. Currently, I still work as a lecturer and I am the head of the Department of Agricultural Economics and Business at the University of Dar es Salaam.

Are you still in touch with your fellow alumni from ZMT?

Since arriving back in Tanzania, I have managed to organise ZMT alumni events in Africa in collaboration with my fellow alumni from the East African region. So far, we have held two regional alumni workshops in East Africa, in 2016 and 2018 respectively, and we expect to hold another one in 2019.



Tri Dewi Kusumaningrum Pribadi, Indonesia

Coordinator of Master Science Programme in the Department of Biology, Universitas Padjadjaran, Bandung

What was your position at ZMT?

After receiving a scholarship from the Indonesian government, I joined ZMT as a PhD student. I was hosted by Mirta Teichberg in the working group on Algae and Seagrass Ecology at ZMT and supervised by Kai Bischof at the University of Bremen.

What are your memories of Bremen?

As a mother of three boys, I worked on my PhD thesis while taking care of my children. They were still very young when we first came to Bremen (6 and 3, and a baby of 13 months). It was very hard for us in the beginning, especially with time management, since I had to do a lot of lab work. I could rarely join in the extra activities at ZMT, but everyone was very understanding. I am also sincerely grateful to ZMT for allowing me to bring my children to the office occasionally when they were on school holidays. I appreciate all the support I got during my time in Germany.

There were so many things to remember from Bremen, but the most notable moment was probably when my children pushed the emergency button a building at the university because they didn't have the electronic keys to get in. The bell rang very loud, people came out of their offices, and we became 'celebrities' in just 10 minutes.

What happened once you left ZMT?

I went back to Indonesia at the end of 2012 and began to teach marine ecology, ecotoxicology, aquatic ecophysiology and algology at Padjadjaran University in Bandung. In 2014, I was promoted to become the head of the laboratory of ecotoxicology. In early 2016, I got another promotion and became the coordinator of the Master Science Programme in the Biology Department. In 2018, I hosted the first regional ZMT Alumni Conference at Padjadjaran University. More than 30 alumni from Asia came to our university together with ZMT staff. As of 2019, I have become a visiting lecturer in School of Marine Science and Biotechnology at Guangxi University for Nationalities, China.



Arturo Dominici-Arosemena, Panama

Chief Resilience Officer, Municipality of Panama

What was your position at ZMT?

From 2001 until 2006, I was a doctoral candidate at ZMT and had a scholarship from the DAAD. My dissertation was on community structure and patterns of diversity in reef fish communities in the tropical Western Atlantic and tropical Eastern Pacific, working in Bocas del Toro (Caribbean coast of Panama) and Bahia Honda, including some sites in the Coiba National Park (Pacific coast of Panama).

What do you remember about your time in Bremen?

There are notable memories of all the key experience I gained from working with researchers at ZMT. I was able to acquire all the tools and scientific approaches that I now use in my professional life, especially with regard to applying scientific knowledge to the management of natural resources at regional and local level.

How did you profit from your time at ZMT? What happened once you left ZMT?

Since 2017, I have been working at the Municipality of Panama as Chief Resilience Officer (CRO) in the framework of the "100 resilient cities initiative". After returning to Panama in 2007, I became Deputy Director of Planning and Integrated Management / Head of the Environmental Unit at the Aquatic Resources Authority of Panama (ARAP). From 2009 to 2013, I worked in the NGO sector as Senior Coordinator of the Conservation International (CI) Marine Programme at the Panama Foundation for Sustainable Development (FUNDESPA). From 2013 – 2017, I was Executive Director of the Ramsar Regional Center for Training and Research on Wetlands in the Western Hemisphere (CREHO) ■

Annexe | About the Projects and Programmes

MADAM:

MAngrove Dynamics And Management

Partner country: Brazil

Project duration: 1995 – 2005

Funding: BMBF

Status: Joint project; coordinated by ZMT
<https://www.leibniz-zmt.de/en/research/research-projects/madam.html>

Lead scientists:

- Prof. Ulrich Saint-Paul (ZMT)
- Prof. Karen Diele (ZMT)
- Prof. Horacio Schneider (UFPA)
- Prof. Victoria Isaac (UFPA)

Partners / Stakeholders:

- Universidade Federal do Pará (UFPA), Belém, Brazil
- Museu Paraense Emílio Goeldi (MPEG), Belém, Brazil

List of publications (selected):

- Saint-Paul, U., Schneider, H., eds. (2010). Mangrove dynamics and management in North Brazil. Ecological Studies 211. Springer, Berlin, 402 pp.
- Lara, R., Szlafsztein, C., Cohen, M., Berger, U., Glaser, M. (2002). Implications of mangrove dynamics for private land use in Bragança, North Brazil: a case study. Journal of Coastal Conservation 8, 97-102.
- Glaser, M., Oliveira, R. da S. (2004). Prospects for the co-management of mangrove ecosystems on the North Brazilian coast: Whose rights, whose duties and whose priorities? Natural Resources Forum 28, 224-233.
- Berger, U., Krause, G., Glaser, M., Koch, B., Lara, R., Saint-Paul, U., et al. (1999). An integrated approach to mangrove dynamics and management. Journal of Coastal Conservation 5, 125-134.

RSP: The Red Sea Programme

Partner countries: Israel, Jordan, Palestine, Egypt

Project duration: 1995 – 2000

Funding: BMBF

Status: Joint project; coordinated by ZMT

Lead scientists:

- Prof. Amatzia Genin (The Hebrew University of Jerusalem)
- Prof. Gotthilf Hempel (ZMT)
- Prof. Ahmad H. Abu Hilal (MSS)
- Prof. Claudio Richter (AWI)

Partners / Stakeholders:

- Marine Science Station (MSS), Aqaba, Jordan
- Interuniversity Institute (IUI), Eilat, Israel
- El Quds University, Jerusalem, Israel
- Hochschule Bremerhaven, Germany

List of publications (selected):

- Hempel, G., Richter C. (2002). The Red Sea Programme: Sailing a nutshell of hope in Red Sea waters. Marine Ecology Progress Series 239, 231-232.
- Genin, A., Jaffe, J.S., Reef, R., Richter, C., Franks, P.J.S. (2005). Swimming against the flow: A mechanism of zooplankton aggregation. Science 308(5723), 860-862. DOI: 10.1126/science.1107834.
- Richter, C., Wunsch, M., Rasheed, M., Kötter, I., Badran, M.I. (2001). Endoscopic exploration of Red Sea coral reefs reveals dense populations of cavity-dwelling sponges. Nature 413, 726-730. DOI: 10.1038/35099547.
- Kaiser, J. (1998). Partnering of the Red Sea lets scientists' bond. Science 279 (5356), 1448. DOI: 10.1126/science.279.5356.1448.

Benguela Current Convention / BENEFIT: BENguela Environment Fisheries Interaction and Training

Partner countries: Angola, Namibia, South Africa

Project duration: 1995 – 2007

Funding: GTZ, BMBF

Status: Joint research project; ZMT was coordinator and research participant of the project

Lead scientists:

- Dr. Holger Auel (Uni-HB)
- Prof. Werner Ekau (ZMT)
- Prof. Gotthilf Hempel (ZMT)
- Dr. Tim Rixen (ZMT)
- Dr. Hans Verheye (DEA, Kapstadt)

Partners / Stakeholders:

- Leibniz Institute for Baltic Sea Research Warnemünde (IOW), Germany
- BreMarE – Bremen Marine Ecology, University of Bremen, Germany
- Institute for Hydrobiology and Fisheries Science (IHF), University of Hamburg, Germany
- University of Cape Town (UCT), South Afrika
- Department of Agriculture, Forestry and Fisheries (DAFF), Cape Town, South Afrika
- Department of Environmental Affairs (DEA), Cape Town, South Afrika
- National Museum, Information and Research Center (NatMIRC), Swakopmund, Namibia
- Alfred-Wegener-Institut für Polar- und Meeresforschung (AWI), Bremerhaven, Germany
- UNAM University of Namibia
- INIP Instituto Nacional de Investigaçã o de Pesca, Luand, Angola
- Marine and Coastal Management (MCM (former Seafisheries)), Cape Town, South Afrika

List of publications (selected):

- Verheye, H.M., Ekau, W. (2005). Maintenance mechanisms of plankton populations in frontal zones in the Benguela and Angola current systems: a preface. *African Journal of Marine Science* 27, 611–615.
- Ekau, W., Auel, H., Poertner, H.O., Gilbert, D. (2010). Impacts of hypoxia on the structure and processes in pelagic communities (zooplankton, macro-invertebrates and fish). *Biogeosciences* 7, 1669-1699.
- Ekau, W., Auel, H., Hagen, W., Koppelman, R., Wasmund, N., Bohata, K., Buchholz, F., Geist, S., Martin, B., Schukat, A., Verheye, H.M., Werner, T. (2018). Pelagic key species and mechanisms driving energy flows in the northern Benguela upwelling ecosystem and their feedback into biogeochemical cycles. *Journal of Marine Systems* 188, 49-62.

LANCET, ECOLOC and TICAS**LANCET: LANd-Sea Interactions in Coastal Ecosystems of Tropical China**

Partner country: China

Project duration: 2006 – 2011

Funding: BMBF

Status: Joint project with 5 subprojects; coordinated by ZMT

<https://www.leibniz-zmt.de/en/research/research-projects/lancet.html>

ECOLOC: Environmental change affecting COastal ecosystems of tropical China during the Anthropocene: Landward vs. OCeanic influence

Partner country: China

Project duration: 2015 – 2018

Funding: BMBF

Status: Joint project with 7 subprojects; coordinated by ZMT

<https://www.leibniz-zmt.de/en/research/research-projects/ecoloc.html>

TICAS: Tackling environmental change Issues of China's coastal Aquatic Systems: Networking, capacity building and knowledge exchange

Partner country: China

Research location: Hainan, China

Project duration: 2017 – 2020

Funding: BMBF

Status: Bilateral research project; coordinated by ZMT

<https://www.leibniz-zmt.de/en/research/research-projects/ticas.html>

Lead Scientists:

- Dr. Tim Jennerjahn (ZMT)
- Dr. Tim Rixen (ZMT)
- Dr. Thomas Pohlmann (IO-UHH)
- Dr. Daoru Wang (HAOFS)

Partners / Stakeholders (LANCET):

- Abteilung Meereschemie, Universität Bremen (Uni-HB)
- Zentrum für Marine und Atmosphärische Wissenschaften, Institut für Meereskunde der Universität Hamburg (Uni-HH)
- State Key Laboratory for Estuarine and Coastal Research (SKLEC), East China Normal University (ECNU), Shanghai
- Hainan Provincial Marine Development Plan and Design Research Institute, Haikou, →

Annexe | About the Projects and Programmes

Hainan (HNMDDI)

- College of Chemistry and Chemical Engineering, Ocean University of China (OUC), Qingdao
- Second Institute of Oceanography (SIO), Hangzhou

Partners / Stakeholders (ECOLOG and TICAS):

- Institute of Environmental Physics (IUP), University of Bremen, Germany
- Leibniz Institute for Baltic Sea Research Warnemünde (IOW), Germany
- Institute of Geology and Geochemistry of Petroleum and Coal (RWTH), Aachen University, Germany
- Institute of Oceanography, Centre for Marine and Climate Research (IO-UHH), University of Hamburg, Germany
- Hainan Academy of Ocean and Fishery Sciences (HAOFS), Haikou, China
- Second Institute of Oceanography (SIO), Hangzhou, China
- Third Institute of Oceanography (TIO), Xiamen, China
- Hainan University (HUN), Haikou, China

List of publications for all three projects (selected):

- Jennerjahn, T.C., Dsikowitzky, L., Zhang, J., Wang, D., guest eds. (2013). Land-Sea interactions in tropical ecosystems of Hainan, China. *Continental Shelf Research* 57, special issue, 142 pp. DOI: 10.1016/j.csr.2012.11.013.
- Herbeck, L.S., Sollich, M., Unger, D., Holmer, M., Jennerjahn, T.C. (2014). Impact of pond aquaculture effluents on seagrass performance in NE Hainan, tropical China. *Marine Pollution Bulletin* 85(1), 190-203.
- Herbeck, L.S., Unger, D., Krumme, U., Liu, S.M., Jennerjahn, T.C. (2011). Typhoon-induced precipitation impact on nutrient and suspended matter dynamics of a tropical estuary affected by human activities in Hainan, China. *Estuarine, Coastal and Shelf Science* 93(4), 375-388.
- Liu, S.M., Li, R., Zhang, G., Wang, D., Du, J., Herbeck, L.S., Zhang, J., Ren, J. (2011). The impact of anthropogenic activities on nutrient dynamics in the tropical Wenchanghe and Wenjiaohe Estuary and Lagoon system in East Hainan, China. *Marine Chemistry* 125, 49-68.

MPA: Marine Protected Area Pulau Pieh

Partner country: Indonesia

Research location: Padang

Project duration: 1992–1997 & 2015–2017

Funding: DAAD, ZMT, GIZ, German Embassy

Status: Joint research project; coordinated by ZMT
<https://scorpionfish.leibniz-zmt.de/>

Lead scientists:

- Dr. Andreas Kunzmann (ZMT, leader until establishment (1992-2000))
- Yogi Yanuar (Project Leader since 2010)
- Sam Samsuardi (Head of Dive Team CV Sanari Padang)
- Darmawan Kakashi (Head of Monitoring Team since 2010)
- Muchtar Ahmad (Bung Hatta University)

Partners / Stakeholders:

- Bung Hatta University, West Sumatra, Indonesia
- CV Sanari (Dive Center), Padang, Indonesia
- SatKer (Monitoring), Padang, Indonesia
- Deutsche Gesellschaft für Technische Zusammenarbeit und Nachhaltigkeit (GTZ), Bonn, Germany
- German Embassy, Jakarta, Indonesia

List of publications (selected):

- Kunzmann, A., Samsuardi (2017). A Century of Change in an Indonesian Coral Reef: Sluiter's Brandewijnsbaai (1890) revisited. *Annual Research & Review in Biology* 13(3), 1-7, DOI: 10.9734/ARRB/2017/33487.
- Kunzmann, A., Samsuardi (2018). It's a long way to save Pulau Pieh. In: Hempel, G., Hempel, I., Hornidge, A.-K., eds. *Scientific partnership for a better future: Bremen's research along tropical coasts*. Edition Falkenberg, Bremen, 111-114. ISBN 978-3-95494-151-3.
- Kunzmann, A. (1997). The coral reefs of West Sumatra. In: Tomascik, T., Mah, A.M., Nontji, A., Kasim Moosa, M., eds. *The ecology of the Indonesian Seas part two*. Periplus Editions (HK) Ltd, Singapore, 1249-1262.

PNG: Papua New Guinea

Partner country: Papua New Guinea

Research location: Kavieng, New Ireland, Papua New Guinea

Project duration: 2005–2009

Funding: GTZ

Status: Joint capacity development project; coordinated by ZMT

Lead scientists:

- Dr. Werner Ekau (ZMT)
- Dr. Daniel Stepputis (TI)
- Dr. Michael Schmid (ZMT)

Partners / Stakeholders:

- NFA & NFC (National Fisheries Agency and College), Kavieng, Papua New Guinea
- University of Vudal (UV), Papua New Guinea
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Bonn, Germany
- Thünen Institute for Sea Fisheries (TI), Hamburg, Germany

ISATEC: International Studies in Aquatic Tropical Ecology

Partner country: Students from more than 60 countries

Research location: Worldwide

Project duration: Since 1999

Funding: University of Bremen, ZMT, DAAD

Status: Joint academic programme

<https://www.leibniz-zmt.de/en/work-study/bachelor-master/masterprogramm-isatec.html>

Lead scientists:

- ZMT: Sonja Bejarano, Werner Ekau, Sebastian Ferse, Marie Fujitani, Astrid Gärdes, Tim Jennerjahn, Lotta Kluger, Andreas Kunzmann, Stefan Partelow, Hauke Reuter, Achim Schlüter, Moritz Stäbler, Mirta Teichberg, Matthias Wolff
- University of Bremen: Holger Auel, Kai Bischof, Wilhelm Hagen, Oliver Janssen-Weets

Partners / Stakeholders:

- University of Bremen, Germany
- Alfred-Wegener-Institut für Polar- und Meeresforschung (AWI), Bremerhaven, Germany

- Max-Planck-Institute for Marine Microbiology (MPI-MM), Bremen, Germany
- Universidad Agraria La Molina, Peru
- Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Costa Rica
- Institute of Marine Sciences (IMS), Zanzibar
- Universities del Valle and Magdalena, Columbia
- and many others

List of publications (selected):

- Wolff, M. (2017). Nachwuchs für das Küstenzonen-Management. In: Hempel, G., Hempel, I., Hornidge, A.-K., eds. Klüger nutzen – besser schützen – Bremer Forschung an tropischen Küsten. Edition Falkenberg, Bremen, 143-146. ISBN 978-3-95494-134-6.
- Wolff, M., ed. (2009). Tropical waters and their living resources: ecology, assessment, and management. Bremen, Hauschild, 343 pp.
- Wolff, M., Janssen-Weets, O. (2019). DAAD Sachbericht EPOS 2018; ISATEC. Universität Bremen, 19 pp.

ZMT's Alumni Network

<https://www.leibniz-zmt.de/en/work-study/alumni.html>

ZMT Alumni Fellowship:

In 2019, ZMT launched the ZMT Alumni Fellowship. The scheme offers up to five alumni the opportunity for a four-week research stay at ZMT and includes travel costs as well as a scholarship. The aim of the fellowship is to encourage joint publications of ZMT's researchers and alumni and to prepare research proposals together, thus fostering the cooperation between the alumni network and working groups on the level of research. In 2019, five Alumni Fellows were chosen out of 19 very good applications from within ZMT's alumni network.

ZMT Alumni Events:

Since 2016, the ZMT Alumni Network met at several conferences organized by ZMT.

- 2016: ZMT Alumni Kick-Off Conference on "Strengthening international links and joint regional action" took place in Bremen, Germany. The Kick-Off Conference gathered →

Annexe | About the Projects and Programmes

50 ZMT Alumni. The conference was funded by the Alexander von Humboldt foundation.

- 2016: The first Regional Alumni Workshop was held in East Africa/Zanzibar. The workshop brought together former guest scientists as well as ISATEC and PhD graduates from all Eastern Africa.
- 2017: The Second Regional Alumni Conference for Alumni from Central and Latin America was held at the Universidad del Magdalena in Santa Marta/Columbia. The goal of the conference was to contribute to the conservation and management of coastal ecosystems in the region and to establish a working line for the regional network. The conference with 35 participants was supported by funding of the DAAD.
- 2018: The third Regional Alumni Conference for Alumni from Southeast Asia was held in Bandung/Indonesia in cooperation with the Universitas Padjadjaran. 25 Alumni discussed the topic "Marine biodiversity for future life: threats, ecosystem services, and connectivity". The conference was supported by funding of the DAAD.
- 2018: Five Alumni joined the CAPTURE Colloquium (Capturing Europe's Respect of Tropical Coral Reefs) at ZMT. Thanks to funding of the DAAD, the five regional experts joined the international symposium on coral reef research and gave a presentation at ZMT.
- 2020: A new Alumni Programme is planned under the overarching topic of Data Management. Funding proposal has been submitted to the DAAD.

Several helpful info sheets and guides in the context of Impact Assessment can be found on the ZMT Homepage

<https://www.leibniz-zmt.de/en/cooperations.html>

- **Bremen Criteria:** ZMT conducts research projects in close cooperation with the partners from the tropics. In order to provide a clear guidance to these projects to implement the cooperation goals, ZMT has developed specific criteria. These "Bremen Criteria" contribute to meeting the scientific and developmental

needs of the tropical partner countries by promoting the establishment of long-term projects with intensive involvement of partner scientists and unrestricted exchange of data and information.

- **Capacity Development Strategy 2025:** Following its mission to provide a scientific basis for the sustainable management of tropical coastal ecosystems, ZMT is deeply convinced that the internalisation and application of sustainability principles in management are connected intimately with a thorough and holistic Capacity Development (CD) at all societal levels. ZMT is contributing to this by strengthening academia in Tropical, mainly Developing Countries putting special emphasis on the empowerment of women.
- **Stakeholder Engagement Guide – Engaging stakeholders within research projects in partner countries:** The approaches to engaging stakeholders are versatile. Although there can be no concrete, catch-all formula, successful engagement activities in research projects benefit from a structured and logical approach that follows basic principles. In order to support ZMT research to plan and implement stakeholder engagement, the ZMT has developed a set of guiding principle.
- **Info sheet – Stakeholder Engagement Tools (Potential tools for engaging stakeholders):** Given the plethora of means to engage with stakeholders, the selection and implementation of approaches and methods is not an easy undertaking. This info sheet helps to gain a first overview about the opportunities.
- **Info sheet – How to write a policy brief?** A policy brief contains various essential and optional elements that establish a clear and logical presentation of problems, evidence and recommendations.

Annexe | Acronyms

| | |
|-----------------|---|
| ANCCHOR | All Atlantic Cooperation for Ocean Research and innovation (co-funded by EU, KDM) |
| ARAP | Aquatic Resources Authority of Panama |
| AWI | Alfred-Wegener-Institute, Bremerhaven, Germany |
| BCLME | Benguela Current Large Marine Ecosystem |
| BENEFIT | Benguela Environment Fisheries Interaction and Training |
| BMBF | Bundesministerium für Bildung und Forschung / Federal Ministry of Education and Research |
| CI | Conservation International (NGO) |
| CIGAR | Consultative Group on International Agricultural Research |
| CREHO | Center for Training and Research on Wetlands in the Western Hemisphere, Panama |
| CRO | Chief Resilience Officer |
| DAAD | Deutscher Akademischer Austauschdienst / German Academic Exchange Service |
| DEA | Department of Environmental Affairs, Cape Town, South Africa |
| ECOLOC | Environmental change affecting Coastal ecosystems of tropical China during the Anthropocene: Landward vs. Oceanic influence (co-funded by BMBF) |
| ELIC | Eilat Leibniz IUI Centre (joint initiative of IUI and the Leibniz Association) |
| EU | European Union |
| FUNDESPA | Marine Programme at the Panama Foundation for Sustainable Development |
| GEF | Global Environmental Facility |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit / German Corporation for International Cooperation |
| GoA | Gulf of Aqaba |
| GTZ | Deutsche Gesellschaft für Technische Zusammenarbeit / German Society for Technical Cooperation |
| IPPC | Intergovernmental Panel on Climate Change |
| ISATEC | International Studies in Aquatic Tropical Ecology |
| IUI | Interuniversity Institut in Eilat, Israel |
| KDM | Konsortium Deutsche Meeresforschung / German Marine Research Consortium |
| LANCET | Land-Sea Interactions in Coastal Ecosystems of Tropical China (co-funded by BMBF) |
| LINI | The Indonesian Nature Foundation |
| M.Sc. | Master of Science |
| MADAM | Mangrove Dynamics and Management (co-funded by BMBF) |



Annexe | Acronyms

| | |
|-----------------------------|--|
| MBREMP | Mnazi Bay-Ruvuma Estuary Marine Park in Tanzania |
| MMAF/KKP | Indonesian Ministry for Marine Affairs |
| MoU | Memorandum of Understanding |
| MPA | Marine Protected Area |
| MPEG | Museu Paraense Emilio Goeldi |
| MPI-MM | Max-Planck-Institut für Marine Mikrobiologie / Max Planck Institute for Marine Microbiology, Bremen, Germany |
| MSC | Most Significant Change |
| MSS | Marine Science Station, Aqaba, Jordan |
| NAM (S&T Centre) | Centre for Science and Technology of the Non-Aligned and Other Developing Countries |
| NATO | North Atlantic Treaty Organisation |
| NFA | National Fishery Authority, Papua New Guinea |
| NFC | National Fishery College, Papua New Guinea |
| NGO | Non-Governmental Organisation |
| PADDLE | Planning in a liquid world with tropical stakes (co-funded by BMBF) |
| Ph.D. | Doctor of Philosophy |
| PNG | Papua New Guinea |
| RESEX | Reservas Extrativistas |
| RSP | Red Sea Programme (co-funded by BMBF) |
| RV METEOR | Research Vessel METEOR |
| TICAS | Tackling Environmental Change Issues of China's Coastal Aquatic Systems (co-funded by BMBF) |
| UFPa | Federal University of Pará, Belém, Brazil |
| UNDP | United Nations Development Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| UNICEF | Kinderhilfswerk der Vereinten Nationen / United Nations International Children's Emergency Fund |
| USA | United States of America |
| US-AID | United States Agency for International Development |
| WG | Work Group |
| WIOGEN | West Indian Ocean Governance and Exchange Network (co-funded by GIZ) |
| ZMT | Leibniz-Zentrum für Marine Tropenforschung / Leibniz Centre for Tropical Marine Research, Bremen, Germany |



Photo: S. Ferse

Author:

Marion Stagars

Copy Editors:

Rebecca Lahl, Claudia Schüller,
Hildegard Westphal

Contributions from:

Andrea Daschner, Susanne Eickhoff,
Werner Ekau, Amatzia Genin,
Ahmad H. Abu Hilal, Tim Jennerjahn,
Andreas Kunzmann, Ulrich Saint-Paul,
Janine Reinhard, Agnes Richard, Nadine
Schmieder-Galfe, Klaus Stagars, Daoru Wang,
Matthias Wolff, Jialin Zhang

Design:

plan² werbeagentur, Bremen

Published by

Leibniz Centre for Tropical Marine Research
Fahrenheitstraße 6
28359 Bremen / Germany

Telephone: +49 (421) 23800-0
Fax: +49 (421) 23800-30
E-Mail: contact@leibniz-zmt.de
www.leibniz-zmt.de

ZMT 
LEIBNIZ CENTRE
for Tropical Marine Research

Leibniz
Leibniz
Association

