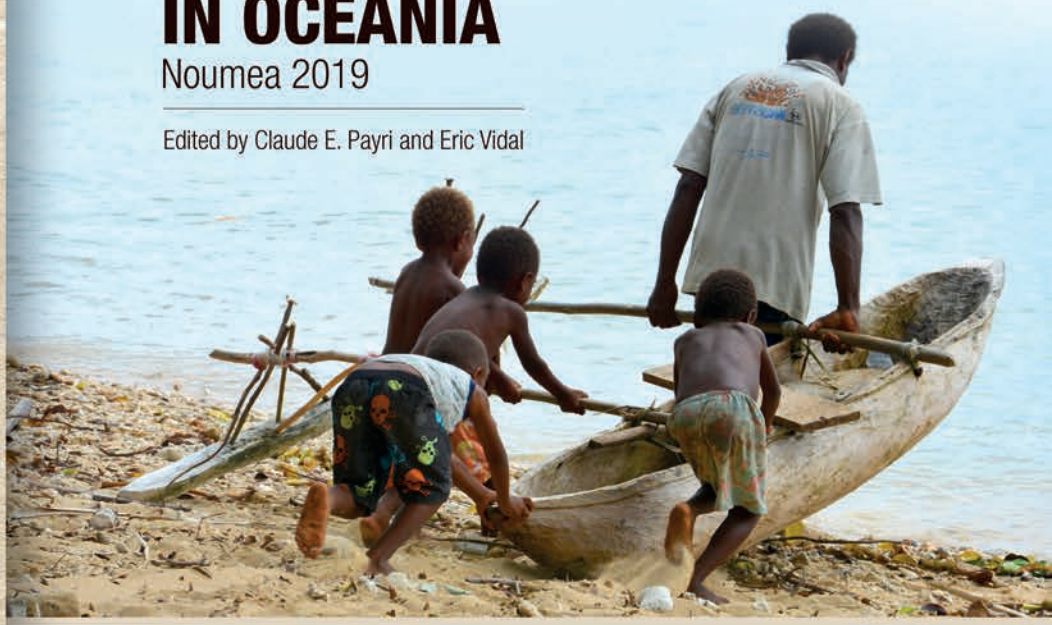
Biodiversity, ecosystem services and socio-economic activities using natural resources

J.Y. Meyer, Yves Letourneur, Claude Payri, Marc Taquet, Eric Vidal, Laure André, Pascal Dumas, Jean-Claude Gaertner, P. Gerbeaux, S. Mccoy, et al.

BIODIVERSITY, A PRESSING NEED FOR ACTION IN OCEANIA

Noumea 2019

Edited by Claude E. Payri and Eric Vidal



UNC UNIVERSITÉ NOUVELLE-CALÉDONIE
PUNC PRESSES UNIVERSITAIRES DE LA NOUVELLE-CALÉDONIE

Cipa pai picaapwi kârâ âboro mâ Göröpuu mâ Nâwië

Manaaki tangata, Manaaki whenua, Manaaki moana, kia kotahi whakahaere ki mua

Waa cèki céŕé tö vèâ pâŕâ Kâmö, Bwêêjë mâ Nérhëë mâi

Tausia lelei o tatou tagata, laueleele, ogasami, malaga fa'atasi I le agaga e tasi

Ta'ofi ke ma'u fakatasi le Tagata, le Kele mo le Moana

Icaasikeune la itre atr, hnadro me hnagejë

Co aodeneni Ngome ne Rawe ne Cele

Strengthening connections between people, islands and the ocean in the Pacific

E hakatahi'ia to te Enana i te Henua me te Tai

Me vakaqaqacotaki na veiwakani ni tamata vata kei na nodra vei yanuyanu kei na nodra vanua kei na wasa liwa kei na kedra yau bula vakavolivolita na Pasifika.

Kraon, solwota mo pipol emi wan oltime

Kia vai kōrari noa te Tagata, te Henua ē te Moana

E natira'a mana tō te ta'ata i te moana 'e te fenua

Tâ'ofi ke ma'u fakatahi te Ha'atagata, te Fenua mo te Moana

Me vakaqaqacotaki na veiwakani ni tamata vata kei na nodra vei yanuyanu kei na nodra vanua kei na wasa liwa kei na kedra yau bula vakavolivolita na Pasifika.

Ntano ngo ntas epei Namouriana

Maintenir unis les Hommes, la Terre et l'Océan

Buildim wan yunion wetem ol pipol, ol aelan mo solwara mo ol plant mo anamol long Pasifik

Ke fakamɜnlohiŋŋi ange nŋae ngɜnhi fehokotakiŋŋanga nŋo e kakai nŋo e ngɜnhi nŋotu motu nŋo e Pasifiki pea mo honau ngɜnhi fonuɜʊ, kae umanŋa nŋae moana, pea moe menŋa monŋui kotoa pe nŋoku iai.

Waa cèki céŕé tö vèâ pâŕâ Kâmö, Bwêêjë mâ Nérhëë mâi

BIODIVERSITY, A PRESSING NEED FOR ACTION IN OCEANIA

Noumea 2019

The authors of the book would like to warmly thank the many people who made it possible to translate the “tagline” of this synthesis work into Oceanian languages, especially the members of the various Oceania language academies, the invited speakers, and the numerous colleagues who forwarded our request. Following this exercise, a large number of different adaptations of this “tagline” have emerged, once again reflecting the vibrant cultural and philosophical diversity of this region of the world.

ISBN : 979-10-91032-09-4

Presses universitaires de la Nouvelle-Calédonie
Avenue James Cook – BP R4 – 98851
Nouméa CEDEX, New Caledonia
unc.nc

Proofreading, editing and layout design support: Françoise Cayrol for the PUNC; Estelle Bonnet-Vidal for Lincks
Translated from French into English by Lydiane Mattio/blue[c]weed
SPC translators for Foreword and Afterword
Published by Françoise Cayrol for the PUNC
Layout : © éteek
Printed by Graphoprint Noumea, August 2019

Recommended citation:
C. E. Payri et E. Vidal (Eds), 2019, *Biodiversity, a pressing need for action in Oceania. Noumea 2019*,
Presses Universitaires de la Nouvelle-Calédonie (PUNC), Noumea, New Caledonia, 64 p.

BIODIVERSITY, A PRESSING NEED FOR ACTION IN OCEANIA

Noumea 2019

Edited by
Claude E. Payri and Eric Vidal

SUMMARY

Fringing coral reef in Papua New Guinea
©IRD/S.Andréfouët

Part 1

BIODIVERSITY, ECOSYSTEM SERVICES AND SOCIO-ECONOMIC ACTIVITIES USING NATURAL RESOURCES

Why is Oceania's biodiversity so unique and therefore so remarkable? How severely is it affected by the global biodiversity crisis and the deleterious consequences of various human activities? What are the relationships between the peoples of Oceania and nature, and how can traditional knowledge complement scientific knowledge? These were the main questions that guided the discussions of this workshop, focused on marine ecosystems, on the one hand, and terrestrial and freshwater ecosystems, on the other. More than 50 experts diagnosed the current state of biodiversity and the various pressures it faces in order to propose specific solutions and recommendations.

AN EXCEPTIONAL NATURAL AND CULTURAL HERITAGE

From the deep valleys of the Marquesas Archipelago to Australia's Great Barrier Reef, through the high forests of Papua New Guinea or the Mariana Trench, Oceania has many original habitats, sometimes unexplored, sometimes extreme. Throughout the history of this region, these have been remarkable places for the development of biological and cultural diversity.

Key message 1 – Oceania is a region of high biodiversity and ecological functions that originate from a unique geological and evolutionary history

With its 8.5 million km^2 of land and a maritime area of 30.5 million km^2, Oceania is a vast group of archipelagos, united by a large ocean, both vital and nourishing. Its 25,000 islands have various origins including continental, oceanic, volcanic and coral islands (atolls). Isolation, sometimes ancient (more than 2.5 billion years for Australia, 500 million years for New Zealand, and 37 million years for New Caledonia) has allowed the emergence of incredibly diverse and often unique forms of life. Endemic and even micro-endemic species are the most significant evidence of the perfect adaptation of life to these isolated and unparalleled habitats.

A global reservoir of terrestrial endemic species

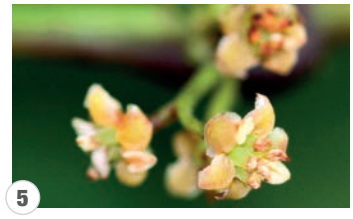
The terrestrial biodiversity of Oceania is known worldwide for its species richness and particularly for its endemic species (which are found nowhere else). Flowering plants, birds, reptiles, terrestrial mollusks, and insects show particularly high rates of endemism, sometimes reaching 75% to 100%, making the islands of Oceania exceptional "biodiversity hotspots" of universal value.

The highest concentration of marine biodiversity in the world

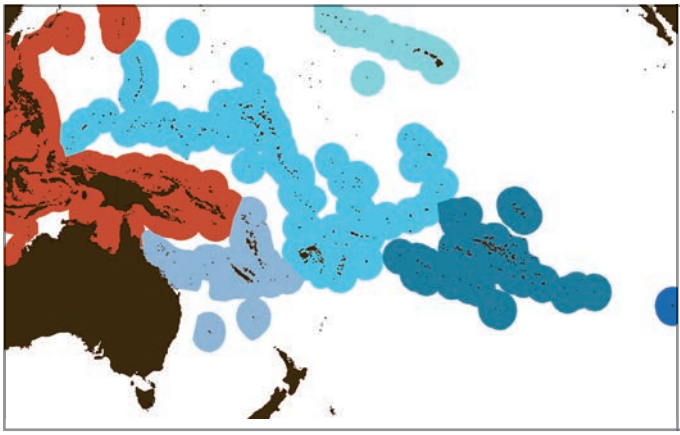
On the marine side, Oceania holds many records. Its islands are home to nearly a quarter of the world's reefs, atolls and lagoons. Their morphological and functional diversity is remarkable. The largest diversity of reef formations, accounting for more than 150 different types, is found in Fiji, Papua New Guinea, and New Caledonia. The Tuamotu Archipelago in French Polynesia is the largest atoll archipelago in the world with 77 atolls. The two longest continuous coral barrier reefs are in New Caledonia (1,600 km) and Australia (2,300 km). Oceania also harbors three of the four deepest oceanic trenches in the world (the Mariana Trench at -11,000 m, the Kermadec Trench at -10,500 m, and the Philippine Trench at -10,300 m) as well as several thousand seamounts. The rate of marine endemism, which is lower than on land, varies from 2% to 10% depending on the taxonomic group and region. Finally, although the coral and coastal ecosystems represent only 1% of the world's surface area, they host the highest concentration of marine biodiversity.

30,000

This is the number of plant species currently recorded in Oceania. Rates of endemism can reach 75% in some countries and almost 90% depending on the ecosystem (e.g., mining shrublands). There are an estimated 3,000 species of terrestrial vertebrates.



1. *The pigeon* Ducula galeata, *an endemic species of the Marquesas Archipelago, status endangered (EN) © J-Y Meyer –* **2.** *The dugong,* Dugong dugon, *Noumea, New Caledonia © IRD/S. Andréfouët –* **3.** *Example of biodiversity rich coral reef from Papua New Guinea © IRD/S. Andréfouët –* **4.** *The koala,* Phascolarctos cinereus, *a tree marsupial endemic to Australia © E. Vidal –* **5.** Amborella trichopoda *belongs to the oldest lineage of flowering plants © IAC/G. Gâteblé —* **6.** *The tuatara or* Sphenodon punctatus, *endemic to New Zealand, Hen and Chicken Islands, the only representative of the order* Rhynocephalia *© J. Gardiner.*



The 26 countries and territories of Oceania are divided into five ecoregions (including the Hawaiian archipelago). Marine ecosystems include mangroves, seagrass beds, coral reefs, lagoons, seamounts, and abyssal trenches. The area covered by the reefs and lagoons of Oceania is 115,000 km² out of a global total of 284,000 km². © IRD/S. Fiat.

Key message 2 – The knowledge of Oceania's biodiversity is currently incomplete, fragmented and unevenly distributed. It exists in part in the form of traditional knowledge

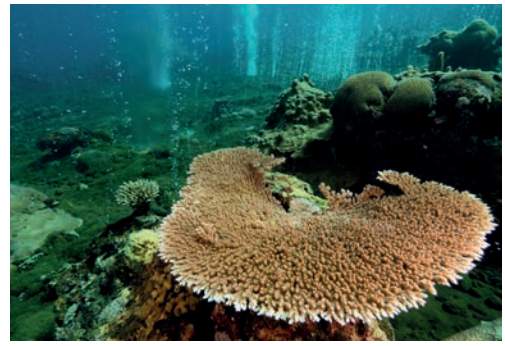
There is currently no comprehensive census of marine biodiversity for Oceania. Available figures are still incomplete and tend to represent mainly fish, corals and commercial invertebrates. Inventories of the major biological groups are only available for a few regions with 15,000 species recorded in New Caledonia and 3,000 species in the Marianas Islands and French Polynesia. The central Pacific island states remain the most poorly known.

Data are also scattered according to groups for the terrestrial fauna, flora and fungi. For example, a total of 9,550 terrestrial species have been recorded in New Caledonia, 498 species of terrestrial gastropods are known to be endemic to French Polynesia and 240 species of marsupials live in Australia.

However, these figures only offer a partial view of reality, because inventories tend to focus on specific biological groups such as corals, fish, birds, or species of commercial interest. Many others are still neglected, including insects and algae, although they play important roles in ecosystems and are sometimes very diverse. In addition, knowledge density varies from country to country, depending on research and data collection capacities. Local traditional knowledge could be used as a basis for developing more effective inventory and conservation strategies. Lastly, advances in genetics are disrupting the current scientific knowledge of living organisms and calling into question many of the previously accepted fundamentals.

Back to the future

Scientists have discovered remarkable ecosystems in some areas of the South Pacific, including Papua New Guinea, New Caledonia, and Palau, where current environmental conditions are close to the scenarios projected by climate experts for the next 50 years (low pH and/or high CO_2 levels and/or warmer water temperatures, etc.). These sites are of particular interest because they harbor coral communities that live in these sub-optimal and peculiar living conditions. They represent natural laboratories and exceptional opportunities to better understand the adaptive mechanisms that corals could develop in response to climate change in the future.



CO_2 bubbles out of intense volcanic vents in the reef, Ambitle region, Papua New Guinea. They provide natural conditions for studying the effect of ocean acidification on the physiology of coral ©IRD/J-M. Boré.

Coral communities (more than 50 species of corals) associated with the mangrove of Bouraké, New Caledonia. They are exposed to pH, oxygen, and temperature values close to those expected in 2050. This site is a natural laboratory providing the ideal conditions to study the effect of climate change on corals © IRD/S. Andréfouët.

A unique global reservoir of genetic resources for food, essential for the survival of mankind

Key message 3 – The diversity of traditional Oceanian practices makes it possible to maintain a remarkable agrobiodiversity

The rich and abundant evolutionary history of the Pacific Island's living organisms has been connected for 6,000 years with that of the various waves of migration and human settlements. These movements have disrupted the pre-existing biological dynamics. In ancient times, navigator-farmers from Asia colonized the Oceanian archipelagos one by one, including the most isolated, and disseminated plants (food, medicinal or ornamental) as well as domesticated and commensal-animals (hens, pigs, dogs, rats). To ensure the food self-sufficiency of human island communities, these plants have been cultivated, sometimes for several millennia, in isolated and constrained systems and according to a variety of traditional practices. These species of interest now form a remarkable agrobiodiversity.

This agrobiodiversity encompasses not only the diversity of plant and animal genetic resources used in agriculture or farming but also soil organisms, insects (pollinators, auxiliaries, etc.) and any other species present in these traditional agricultural systems. It also includes the diversity of organisms found in natural and semi-natural habitats linked to food production.

1

2

1. *Giant swamp taro garden with coconuts, bananas, and betle nut, Koror Island, Palau © R. Thaman –* **2.** *Yam harvest, Gohapin Tribe, New Caledonia © IAC/N. Petit.*

CePaCT, a valuable bank of resources

The Centre for Pacific Crops and Trees (CePaCT), located in Fiji and managed by the Pacific Community (SPC), hosts the only *in vitro* gene and seedling bank in the Pacific region, as well as a wide range of cultivated species. Between 2004 and 2017, the CePaCT disseminated about 22,000 seedlings in the region and around the world.

I learned a lot from the people of Oceania. Indigenous peoples hold traditional knowledge, linked to ancestral observations and uses, which is often more detailed than scientific knowledge. This knowledge is transmitted orally by the elders and is, unfortunately, being lost. It is becoming urgent to collect this knowledge, ethically and in accordance with customs, in order to teach young people how to identify species. This is the principle of "Name it or lose it"!

© IRD/N. Petit.

Pr. Randy Thaman,
The University of
the South Pacific, Fiji

***The New Caledonia herbarium**, managed by the IRD in Noumea, houses a representative collection of the flora of New Caledonia and many specimens from the Pacific region. It currently includes approximately 85,000 specimens © IRD/D. Bruy.*

Key message 4 – The lifestyle of Oceanian populations is closely dependent on natural resources

Isolated and scattered across the world's largest ocean, Oceanian populations have forged close dependencies on nature over time. Consequently, the accelerated erosion of biodiversity and the dysfunctions caused to ecosystems are gradually depriving Oceanian populations of basic goods and services. Coastal and lagoon ecosystems (mangroves, seagrass meadows, algae beds) represent important biodiversity issues for the eight million islanders who directly depend on them. These natural environments are both a vital source of food and the cornerstone of their social, cultural and spiritual identity.

The Aborigines of Australia and the first inhabitants of present-day Papua New Guinea have colonized their lands for more than 50,000 years. Unrestricted by the space available, unlike most other Oceanian peoples, they were essentially nomadic hunter-gatherers. Nevertheless, they developed agriculture 15,000 and 7,000 years ago, respectively, independently of other regions (Middle East, China, Mesoamerica). In addition, genetic studies have shown that Papua New Guinea has been an important dissemination source of certain food plants for the South Pacific. This is, for example, the case for plantain bananas.

1

2

1. *Oceania hosts 30 UNESCO World Heritage Sites, two-thirds of which are natural sites. Upi Bay, the Isle of Pines © Province Sud/M. Dosdane* – **2.** *The Marae Taputapuatea in Ra'iata Island, French Polynesia © GIE Océanide/J.-B. Herrenschmidt.*

A REGION UNDER PRESSURE

Endemic species and island ecosystems have developed a fragile equilibrium that is particularly sensitive to the rapid external changes and stresses associated with human activities. Despite its isolation and a relatively small human population (40 million people), Oceania is not immune to the biodiversity crisis...

Key message 5 – Oceania is at the center of the biodiversity crisis and its associated dysfunction of ecosystem services

As in the rest of the world, in Oceania, terrestrial, marine and freshwater ecosystems are under increasing pressure and face threats of anthropogenic origin. Some are internal (local), but external pressures are also a large part.

Internal pressures are related to the past or current practices of Oceanians. They include deforestation, fires, urbanization, the construction of infrastructure and transport networks, the unsustainable local use of certain natural resources, various forms of pollution linked to imperfect waste management, etc.

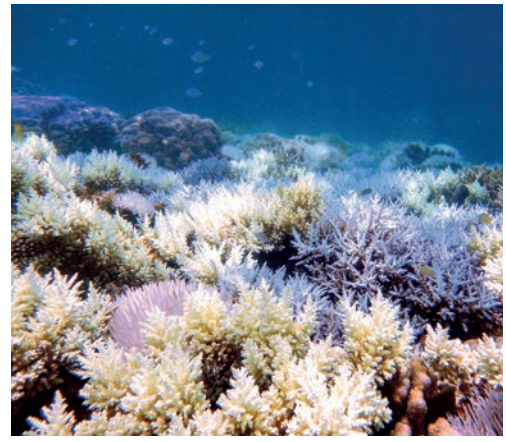
External pressures come from the outside and they are constantly increasing. These include invasive introduced species, the overexploitation of natural and mining resources, pollution, mass tourism and, finally, the effects of climate change (changing rainfall patterns, increasing ocean temperature and acidification, sea-level rise, coral bleaching, emerging coral diseases, and the explosion of predator populations such as the sea star *Acanthaster*). Island environments are much more vulnerable to external pressures, that negatively affect biodiversity than continental environments.

Local and global changes are currently generating and will continue to generate major disruptions, the impacts of which on ecosystem functioning and structure are still poorly understood. These pressures lead to the degradation of natural habitats and an increasingly rapid decline in biodiversity and species abundance. The most vulnerable species are becoming scarcer and the risk of extinction is increasing. This is the case for the New Caledonian population of dugong. Disruptions and disequilibria can, on the other hand, lead to blooms of certain species that can generate shifts in natural communities and landscapes.

An organism that has evolved over thousands or even millions of years in a particular place is a heritage, an ecological value. It is difficult to imagine that in a few decades, a heritage of several million years could be cleared away. We must also keep in mind that when a species disappears, there is no substitution possible. This is irreversible and the interactions that this species had established with other species are also disappearing, with sometimes dramatic consequences for other species as well as for humankind.

Philippe Grandcolas, Research Director at the CNRS, Paris

@IRD/N. Petit.



Fully bleached branching coral community, Roche Blanche, South Lagoon, New Caledonia © IRD/F. Benzoni.

75%

of the animal species that have disappeared from the planet were island species. For birds, this figure reaches 90%. It is estimated that more than 1,000 species of land birds have become extinct in the islands of Oceania since their colonization by humans, representing over 10% of the world's avifauna.

50%

of Australia's live coral barrier reef coverage "disappeared" between 1985 and 2012 as a result of bleaching episodes, cyclones and *Acanthaster* outbreaks. This was followed by the disappearance of an additional 30% during the 2016 heat wave. Elsewhere, the situation is less alarming with a stable living coral cover over several decades. However, the most vulnerable species are being replaced by more resistant species, leading to a decrease in biodiversity.

Lake Lalolalo, Wallis Island. Many islands have fragile freshwater reserves, threatened by a risk of chemical (hazardous waste) and saline (rising water) pollution and overexploitation © IRD/T. Berr.

Key message 6 – Habitat loss, land and sea use changes and biological invasions are the greatest threats to biodiversity and ecosystem services in Oceania

The IPBES plenary session of April 2019 reclassified the most significant factors affecting nature globally by their order of importance[1], but this ranking differs for Oceania. The destruction of natural environments and the introduction of invasive species are the two main drivers of biodiversity erosion in island ecosystems: biodiversity loss and the resulting cascading degradation modify the functioning of ecosystems and alter ecological services that are useful to wildlife and flora, as well as human populations. The consequences for the latter are numerous: difficult access to resources (food, water, raw materials), reduced soil fertility (and therefore agricultural yields), increased agricultural pests, lower resistance to disease, soil erosion, floods, economic and cultural losses, etc.

Pastures for extensive livestock farming, New Caledonia © IAC/T. Hue.

Freshwater, a vital resource

Rivers, lakes and other wetlands are important social environments in the Pacific because they are areas that provide ecological services and are a source of well-being for people. Little is known about the biodiversity of these ecosystems. The construction of artificial reservoirs to supply inhabited and tourist areas dries up rivers and prevents the migration of certain species while favoring mosquito populations, which are potential vectors for pathogens. Soil pollution and biological invasions are other major threats. The conservation priority is to protect forest areas in watersheds and to work with indigenous peoples and their ancestral management knowledge.

Six global biodiversity hotspots

Oceania is home to six of the 36 biodiversity hotspots identified worldwide. These are southwestern Australia, the forests of eastern Australia, and the islands of eastern Melanesia, New Caledonia, New Zealand, and Polynesia-Micronesia. Global biodiversity hotspots are areas where the very rich biodiversity is particularly threatened by human activities. These sites are key targets in global management and conservation strategies. The large number of hotspots in Oceania testifies to its exceptional biodiversity, but also to its high vulnerability.

The capture of a Pacific rat, Rattus exulans, *a high-impact invasive species @ IRD/CNRS/T. Vergoz.*

[1]Land and sea use changes; the direct exploitation of certain organisms; climate change; pollution and toxic and invasive species.

Offshore fishing: declining stocks

The significant increase in the industrial fishing pressure exerted by the major fishing countries, most of which are not located in the area, is weighing heavily on the sustainability of the shared stocks. This is particularly the case for tuna resources, for which the competition between industrial and artisanal fishermen is increasingly strong, depriving island communities of the full benefit of their coastal waters. At a smaller scale, coral ecosystems also suffer the harmful effects of sometimes poorly controlled fishing, in addition to the negative effects of indirect pressures such as the anthropization of coastal areas (development, pollution, etc.) or further upstream in catchments (deforestation, soil erosion, etc.).

Small coastal fisheries: resources are becoming scarce

Oceanian coastal populations are highly dependent on marine resources. Subsistence fishing is estimated to account for about 70% of coastal fish catches. This informal, opportunistic exploitation, which is still very difficult to quantify, involves many organisms such as fish, mollusks, crustaceans, and echinoderms. Several hundred species have traditionally been exploited. The increasing scarcity of these resources, linked in particular to rising anthropogenic impacts on coastal ecosystems, calls for the development of management strategies adapted to the regional context. This approach is currently made particularly difficult by a lack of fundamental knowledge about the biology and ecology of the targeted resources.

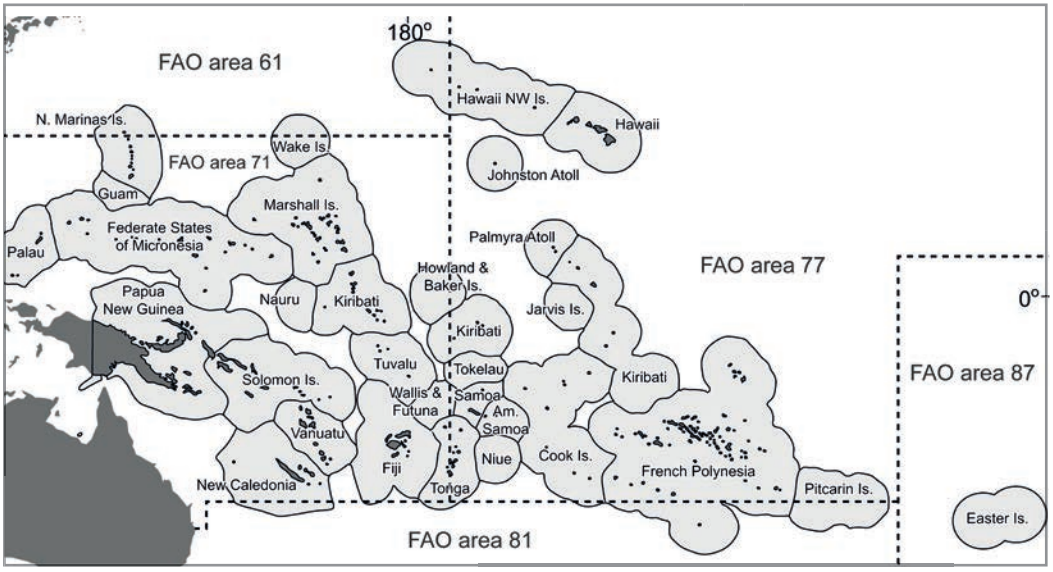
The increasingly systematic use of offshore fish aggregating devices (FADs) is making a significant contribution to the depletion of fish stocks © IRD / M. Taquet.

Cast-net fishing, a technique widely used in Oceania © P.-A. Pantz

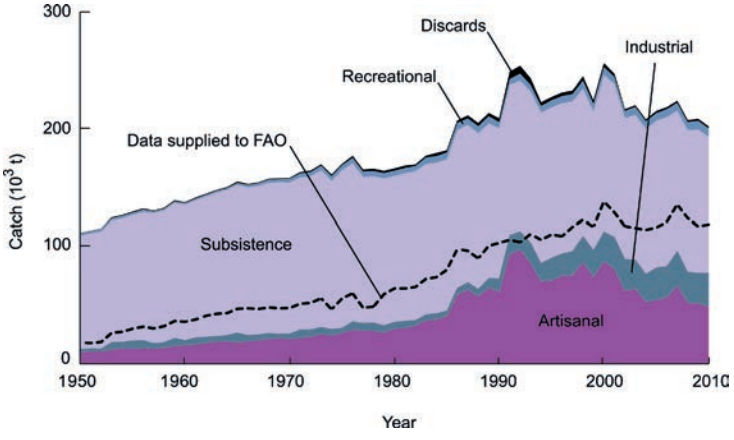
The fishing catches of 25 Pacific Island Countries, States and Territories have doubled in half a century, from 110,000 tons per year in 1950 to over 250,000 tons per year in 2000, and declined to about 200,000 tons per year in 2010. These catches include artisanal fisheries (small commercial and subsidized, undervalued), industrial fishing and recreational fishing. According to known data, artisanal fishing accounted for 25% of the catches in 2010, but the latest data show that this activity was divided by two over the last two decades, with catches decreasing from 97,000 t/year in 1992 to less than 50,000 t/year in 2010. This fishery is essentially a non-commercial subsistence fishery. In my view, marine resource management agencies throughout the Pacific need to be aware of the importance of their reefs and/or inshore fisheries for the food security of their populations, particularly in rural areas. Nowadays, these resources cannot be managed unless their current level of exploitation is properly known.

@IRD/M. Vilayleck.

Pr. Daniel Pauly, The University of British Columbia, Institute for the Ocean and Fisheries, Canada, Director of Sea Around Us



The Sea Around Us research group performed fisheries catch reconstruction studies for 25 Pacific island countries, states, and territories. Source: Zeller et al. (2015) and www.seaaroundus.org.



Total catches increased from 110,000 t/year in 1950 (of which 17,400 tons were reported) to a peak of over 250,000 t/year in 2000, before declining to around 200,000 t/year by 2010. This decrease is driven by a declining artisanal (small-scale commercial) catches, which was not compensated for by increasing domestic industrial (large-scale commercial) catches. The artisanal fisheries appear to be declining from a peak of 97,000 t/year in 1992 to less than 50,000 t/year by 2010. Source: Zeller et al. (2015) and www.seaaroundus.org.

IT IS NOT TOO LATE TO TAKE ACTION

The islands and maritime areas of Oceania are, in many ways, at the forefront of the upheavals affecting the planet. Due to their vulnerability and rapid response, they represent critical "sentinel ecosystems" for the international community. They are also incredible natural laboratories and ideal places to develop and test new solutions. Faced with this potential and the major challenges of global change, the workshop experts proposed a series of solutions and recommendations.

Key message 7 – Nature can be better preserved, better protected and used in a more sustainable way

The conservation of these remarkable terrestrial and marine ecosystems, their biodiversity and associated ecosystem services, as well as the sustainable management of habitats and natural resources, have become critical issues in the Pacific. Maintaining this unique and original biodiversity and the resilience of the various ecosystems requires:

- Protecting natural areas of high heritage or ecological value that also provide vital ecosystem services. For example, coastal areas, dry forests, humid forests, scrublands, subalpine vegetation, mangroves, seagrass meadows, coral reefs, etc.
- Restoring or rehabilitating degraded or invaded natural habitats.
- Protecting the most threatened endemic species.
- Maintaining and preserving the genetic diversity of cultivated plants.
- Better managing of coastal fisheries.
- Developing organic and sustainable agriculture.
- Safeguarding traditional knowledge.

Science festival with high school students, Wallis Island © IRD/T. Berr

Surveys on traditional varieties of kanak cabbage, Lifou Island, New Caledonia © IAC/N. Robert.

Key message 8 – Knowledge needs to be improved, better shared and more widely disseminated

The current knowledge of Oceania's biodiversity is incomplete, fragmented and unevenly distributed. To fill the gaps in current knowledge, the need to extend efforts to all areas is becoming urgent, as well as increasing research efforts in the most well-studied countries and sites. Despite the abundance of publications on Oceania, the island countries of the Central Pacific remain the least well-known in terms of their marine biodiversity and significant gaps remain for terrestrial ecosystems, particularly regarding the pressures they face. Several approaches are proposed for improvement:

- Increase knowledge about biodiversity (species, abundances, etc.) and the understanding of the fundamental roles of species, particularly key species, in the structuring, functioning, and dynamics of ecosystems.
- Better assess the vulnerability and resilience of ecosystems and populations to global change, but also assess more accurately the responses to the various disturbances, in particular in terms of tolerable carrying capacities and ecological tipping points.
- More accurately and comprehensively estimate and define the scientific, ethical, socio-economic and cultural value of the habitats, ecosystems, and species they contain, taking into account indigenous traditional ecological knowledge and practices (e.g., for small-scale coastal fisheries or agroforestry).
- Establish synergies and complementarities between modern scientific knowledge and traditional knowledge to define and evaluate public policies for the conservation and management of biodiversity and ecosystem services in Oceania.
- Maintain, disseminate and share traditional and local taxonomic knowledge that is often transmitted orally: "Name it or lose it". Creating spaces for the exchange and sharing of knowledge would make it possible to combine modern and traditional knowledge, which are inseparable and complementary.
- Make knowledge accessible and more intelligible to as many people as possible and, to this end, ensure effective dissemination to decision-makers, the educational sector, and the general public. It is essential to integrate knowledge about biodiversity and ecosystem services into all public policy thinking.
- Promote the intergenerational transmission of knowledge and skills related to biodiversity and ecosystem services. It is also important to train and mentor the next generation of Oceanian experts.

Traditional weaving lesson, Opoa school, Ra'iatea Island, French Polynesia © GIE Oceanide/J.-B. Herrenschmidt.

Extensive ecological restoration: the case of the Vale NC program

The Vale NC industrial complex, located in the south New Caledonia, includes a 1,900 hectares plant site for ore extraction and the production of nickel and cobalt. Vale NC is running a vast program to rehabilitate the operating environments, based on the activities of an industrial incubator set up in 2010. Each year, the central nursery, as well as satellite nurseries managed by neighboring tribes, produce 300,000 endemic plant species. Of the 400 endemic species of the mining scrubland, about 240 different endemic species are now produced using processes that have required many years of knowledge acquisition and technical development. To date, nearly 230 hectares have been replanted using more than 1.2 million seedlings.

Plant breeding at the Vale NC nursery for ecological restoration and revegetation programs © Lincks/E.Bonnet-Vidal.

Key message 9 – We must work for greater ethical and scientific solidarity in Oceania

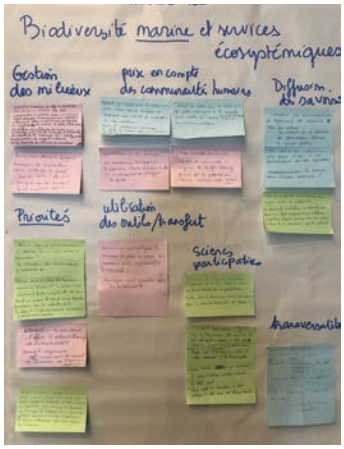
For the experts, taking into account Oceania's biodiversity and associated ecosystem services requires strengthening the links between scientific disciplines, traditional and contemporary knowledge as well as establishing a global vision that is shared and accepted by all. To achieve this objective, they agreed to recommend the following actions:

- Increase local research capacities in infrastructure and personnel, particularly in small island developing states (SIDS), for example through support from scientific institutions in scientifically developed countries or territories of the Oceania region or other regions of the world.
- Conduct and secure long-term monitoring of biodiversity and ecosystem services through the establishment of shared observatories and databases and the construction of predictive models and "future scenarios" adapted to the relevant geographical scales in Oceania.
- Strengthen existing networks between researchers and academics (PIURN, CRESICA, RESIPOL) and develop close collaborations with regional agencies (e.g., SPREP), environmental and natural resource stakeholders, as well as with local, customary, administrative and even religious communities, and authorities.
- Promote access to and sharing of bioinformatic data (databases, genetic sequences, etc.) in compliance with the ethics and deontology that should govern this type of action.
- Co-construct research and conservation projects with stakeholders and local communities, collectively identifying relevant monitoring indicators and prioritizing actions.
- Involve all relevant actors and stakeholders during all phases of the research process, before, during and after assessments of ecosystem goods and services.
- Develop science programs on biodiversity and ecosystem services and incorporate them into all levels of education and training (primary, secondary, university, and professional training).

Particular attention should be paid to the traditional knowledge held by Oceanian women as they are engaged in fishing (crabs, shellfish), agriculture or horticulture activities that are their own and represent important livelihoods.

© IRD/N. Petit.

Pr. Gilles Bœuf, Sorbonne University, President of the French Biodiversity Agency



Workshop © IRD/N. Petit.

Coordinated by J.-Y. Meyer, Y. Letourneur, C. E. Payri, M. Taquet, E. Vidal.
With the contribution of L. André, P. P. Dumas, J.-C. Gaertner, P. Gerbeaux, S. McCoy, D. Pauly, R. Rodolfo Metalpa, A. Steven, R. Thaman, S. Van Wynsberge.
Editorial support by E. Bonnet-Vidal.

LIST OF ACRONYMES

ABS	Access and Benefit Sharing
CBD	Convention on Biological Diversity
CePaCT	Centre for Pacific Crops and Trees
CNRS	National Center for Scientific Research (Fr)
CODIM	Marquesas Islands Community of Municipalities
COP	Conference of the Parties
CRESICA	Consortium for Research, Higher Education, and Innovation in New Caledonia
EEZ	Exclusive Economic Zone
FAIR science	Findable, Accessible, Interoperable but also Re-usable science
FRB	French Foundation for Research on Biodiversity
IAC	New Caledonian Institute of Agronomy
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IRD	French National Research Institute for Sustainable Development
IUCN	International Union for Conservation of Nature
CR	Critically Endangered (extremely high risk of extinction in the wild)
EN	Endangered (high risk of extinction in the wild)
LMMA	Locally-Managed Marine Areas
MAB	Man & Biosphere
MEAs	Marine Educational Areas
NGO	Non-Governmental Organization
PIPA	Phoenix Islands Protected Area
PIURN	Pacific Islands Universities Research Network
RESIPOL	Consortium for Research, Higher Education, and Innovation in French Polynesia
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SISterrs	Small Island States and Territories
SPC	Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Program
UNC	University of New Caledonia
UPF	University of French Polynesia

Isabelle Staron-Tutugoro is an artist, painter, and engraver from New Caledonia. Isabelle was born in Saint-Symphorien-sur-Coise, a village near Lyon (France). At the age of 22, she travelled to New Caledonia, fell in love with the colors and lights of nature, and decided to settle there. Her artwork is very inspired by Kanak culture and often depicts petroglyphs, Kanak bamboos, and Lapita pottery.
The turtles engraving, chosen to illustrate the book, is inspired by a fact that marked the childhood of Isabelle's son. In Poindimié, at the end of the 1990s, turtles used to return to the same place each year to lay their eggs. Pre-schools and primary schools used to take children to feed baby turtles and educate them about the importance of protecting not only the species but also our lagoon. Then comes a series on the fishes of the lagoon and the geckos, which are symbolic animals (totems!) of New Caledonia.

Cover photo credit : Pirogue, Pentecost Island, Vanuatu and Community garden, Pentecost Island, Vanuatu ©F. Cayrol/LabEx-CORAIL-UNC Rain forest, New Caledonia ©IAC/N. Petit.

Cipa pai picaapwi kârâ âboro mâ Göröpuu mâ Nâwië

Manaaki tangata, Manaaki whenua, Manaaki moana, kia kotahi whakahaere ki mua

Waa cèki céŕé tö vèâ pâŕâ Kâmö, Bwêêjë mâ Nérhëë mâi

Tausia lelei o tatou tagata, laueleele, ogasami, malaga fa'atasi I le agaga e tasi

Ta'ofi ke ma'u fakatasi le Tagata, le Kele mo le Moana

Icaasikeune la itre atr, hnadro me hnagejë

Co aodeneni Ngome ne Rawe ne Cele

Strengthening connections between people, islands and the ocean in the Pacific

E hakatahi'ia to te Enana i te Henua me te Tai

Me vakaqaqacotaki na veiwakani ni tamata vata kei na nodra vei yanuyanu kei na nodra vanua kei na wasa liwa kei na kedra yau bula vakavolivolita na Pasifika.

Kraon, solwota mo pipol emi wan oltime

Kia vai kōrari noa te Tagata, te Henua ē te Moana

E natira'a mana tō te ta'ata i te moana 'e te fenua

Tâ'ofi ke ma'u fakatahi te Ha'atagata, te Fenua mo te Moana

Me vakaqaqacotaki na veiwakani ni tamata vata kei na nodra vei yanuyanu kei na nodra vanua kei na wasa liwa kei na kedra yau bula vakavolivolita na Pasifika.

Ntano ngo ntas epei Namouriana

Maintenir unis les Hommes, la Terre et l'Océan

Buildim wan yunion wetem ol pipol, ol aelan mo solwara mo ol plant mo anamol long Pasifik

Ke fakamɔnlohiŋŋi ange nŋae ngɔnhi fehokotakiŋŋanga nŋo e kakai nŋo e ngɔnhi nŋotu motu nŋo e Pasifiki pea mo honau ngɔnhi fonuɔʊ, kae umanŋa nŋae moana, pea moe menŋa monŋui kotoa pe nŋoku iai.

Waa cèki céŕé tö vèâ pâŕâ Kâmö, Bwêêjë mâ Nérhëë mâi

BIODIVERSITY, A PRESSING NEED FOR ACTION IN OCEANIA

Noumea 2019

Edited by Claude E. Payri and Eric Vidal

The planet's biodiversity is in danger! This unprecedented crisis is severely affecting the islands of Oceania, which are particularly vulnerable to the consequences of global change (warming, flooding, invasions, etc.). While the region as a whole contributes little to the climatic issues or even mitigates them, the Oceanian territories are strongly impacted.

The mobilization around the 2019 7th IPBES Plenary in Paris was an opportunity to promote the value of biodiversity and associated services in Oceania. While the conclusions of the Asia-Pacific chapter are clear, it is not too late to take action in this region where Man and Nature have developed very strong ties. To better understand the situation in these thousands of islands scattered over several tens of millions of square kilometers of ocean, a workshop dedicated to biodiversity in Oceania was organized in Noumea, New Caledonia, on the 24th and 25th of June 2019. This was a unique opportunity for seventy participants to discuss, debate and try to find solutions to face the seriousness of the situation.

This publication summarizes the main highlights and key messages of these two intense days of work, discussion and debate. It stresses the specificities of the biodiversity crisis in Oceania. Intended for decision-makers, but also for a wider audience, this document has the ambition to make the voices of Oceanians better heard on the international scenes dedicated to biodiversity and ecosystem services.

ISBN: 979-10-91032-09-4