

# The lagoon: a natural heritage and recreational space

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Amédée Islet, a very touristic lagoon location. © P.-A. Pantz

## Recreational uses: a challenge for coral reef management

"Recreational users" are defined as a group of people who engage in an activity for their leisure only, with no subsistence need or profit motive. These activities are characterized by a diversity of practices and under the influence of population growth and the development of tourism, their number in natural areas is increasing sharply. As is the case in New Caledonia, one of the world's largest lagoons listed as a UNESCO World Heritage Site in 2008, recreational use is intensifying and diversifying in all coastal areas.

Recreational activities such as fishing, scuba diving and water sports play at least two roles:

- an economic role by boosting a pool of activities through tourism or the boating industry;
- a social role in providing goods and services to people.

At the same time, they affect coral reef ecosystems that are already threatened by global climate changes. It is therefore essential to consider recreational uses in the sustainable development of coastal zones, particularly in island environments. Scientific studies have focused on the diversity of recreational activities in marine and

coastal environments (diving, boating, water sports) since the year 2000. This research was motivated by the growing need for knowledge and the complexity of the relations between a prolific society and the natural world, on which it depends, which is also a limited resource, and which is particularly fragile in coral reef environments. Research aims at better understanding socio-ecosystems to assist the management of these areas, notably through the establishment of Marine Protected Areas (MPAs). Within these MPAs, which have objectives as diverse as biodiversity conservation and sustainable use, recreational activities are widely practiced. It is therefore essential to improve the understanding of these activities not only just to ensure the protection of ecosystems and the resources that they depend on, but also to anticipate the emergence of conflicts for space occupation and resource exploitation.

However, recreational users are still not well understood. This is mainly due to the difficulty of designing appropriate methodologies and tools that ensure the reliable collection of information, over time, on their number, location and practices. In New Caledonia, research has led to the development of methods for assessing the pressures and impacts of these uses. These methods are adapted to the coral reef environment and allow the acquisition of knowledge useful to the preservation of lagoon ecosystems that are managed by a network of MPAs.



Survey of a recreational fisherman at Pandanus Islet in 2014. © IFREMER/C. Gonson

## Recreational uses: research for sustainable development

The promotion of the natural heritage of coral ecosystems and their conservation is a real challenge for the sustainable development of New Caledonia. First, the increasing demographics, and then the development of boating and tourism, have led to recreational activities being considered a threat to the sustainable management of fisheries resources and the conservation of reefs. These uses are not well known and are difficult to quantify because of their scattered and informal nature. This is why, since the 1990s, research programs and projects have involved local stakeholders, environmental managers and scientists.

Scientific studies first focused on improving the assessment of pressures and impacts of small-scale coastal fisheries (commercial, subsistence, recreational). In 2005, catches by recreational fishers on motorized boats were estimated at more than 1,100 tons/year in the Southwest Lagoon. Made up mainly of fish and shellfish species, these catches are concentrated on reefs near urban centers (Nouméa and Koné) and in the northern and southern lagoons of Grande Terre. Findings highlighted the importance of studying recreational fishing.



Cruise ship anchored at Lifou. © IFREMER/D. Pelletier





Conflictual cohabitation between users in the anchorage zone of an islet.  
© IFREMER/C. Gonson

Subsequently, because of the issues and costs associated with the complex management of lagoon uses, the substantial development of other activities, such as boating, diving and island excursions raised concerns among public authorities and research organizations. With the improvement of knowledge on coral reef recreational uses, the complexity of the coastal systems under study (the diversity of recreational activities, ecosystems and their connections) is becoming better reflected in research projects. The concept of a socio-ecosystem is increasingly important, including the development of multidisciplinary and spatially explicit approaches.

Recreational activities associated with coral reefs are now better known. This knowledge supports the effectiveness of the management strategies that are implemented for a variety of objectives such as resource management, biodiversity conservation and sustainable use. In the New Caledonian Lagoon, particularly within MPAs and UNESCO World Heritage sites, numerous research programs and management measures (e.g., regulations, awareness-raising) have targeted recreational uses. However, historical knowledge of these uses is limited. In addition, the rapid changes in



Larégnère Islet under heavy traffic. © IFREMER/C. Gonson

these uses (e.g., diversification of activities, expansion of tourism), which coincide with global climate change, threaten the sustainable development of New Caledonia's maritime space.

## The lagoon under surveillance: an explosion in the number of boats

In the Southwestern Lagoon, close to Nouméa, a large population converges with numerous nautical infrastructures. Promoting the natural heritage associated with coral reefs while protecting ecosystems close to urban centers is a major management challenge for New Caledonia. In this area, studies involving researchers and environmental managers have led to the development of observation protocols and indicators relevant to the monitoring of uses, their impacts and governance issues.

Between 2005 and 2013, nearly 700 field trips and over 2,000 questionnaires were carried out to estimate the number, attendance and spatial and temporal distribution of recreational users, as well as

to characterize their practices and opinions regarding the management and ecological state of ecosystems. Today, the methods for observation and the production of indicators have been optimized. Fully operational, they can now be implemented by environmental managers in New Caledonia, such as the provincial authorities and local management committees of UNESCO World Heritage sites.

During this period of less than 10 years (2005 to 2013), the number of boats visiting the reefs and islets around Nouméa more than doubled. These are mainly residents of the Nouméa agglomeration (Grand Nouméa), with at least 10 new boats joining the recreational fleet each week. In addition, the development of taxi-boats as led to an increase in the number of people visiting islets. For example, in 2013, it is estimated that over 10,000 boats and 80,000 people travelled to Maître Islet, and other islets located very close to Nouméa.

The activities are diverse and influence the occupation of the coastline by users in relation to the regulations and to the natural and social characteristics of the areas they use. The development of infrastructures (e.g., Maître Islet) can be used to attract large numbers of visitors, where specific activities (such as kitesurfing) are carried out. Protected natural areas, aimed at the conservation of species and natural habitats, with simple but attractive facilities such as moorings or shelters, are also popular because people expect high environmental standards (e.g., Signal Islet). In contrast, unregulated and often more remote areas tend to be targeted by boaters who want to fish and enjoy quiet islets that are less visited.

Based on the information collected, a simulation model aimed at promoting the adaptive management of lagoon areas, was used to assess the effect of management measures on the evolution of biodiversity and its uses. Results indicate that the development of alternative recreational areas (for example by providing parking lots or navigation buoys and markers) in coastal zones that are less vulnerable to the pressures associated with recreational activities (e.g., sand beaches) could limit the impacts on reefs and islets by draining part of the lagoon's users.

## **Sustainable recreational uses for a lagoon under pressure**

The sustainability of coral ecosystems and their recreational uses depends on several variables, including ecological and social factors: ecological, because ecosystems suffer impacts that depend on their vulnerability to user activities and behavior; social, because the sustainability of uses also depends on whether people are satisfied with their experience of the lagoon. This satisfaction is particularly dependent on their ability to tolerate the presence of other people, in large numbers and in the same space, and their ability to practice their activities.

The distribution of users is increasingly heterogeneous, depending on the area and the time of year or week. Visitor peaks are now more frequent, and the associated pressures are also more intense, impacting very localized areas such as islands and reefs closest to coastal accesses. These pressures result in ecological impacts that alter the state of ecosystems, by the depletion or even extinction of the most sensitive species and habitats, and the modification of fish and invertebrate populations. However, the ecological quality of reef ecosystems also contributes to the sustainability of recreational activities, such as scuba diving or the simple enjoyment of coral reef seascapes. Users are increasingly aware of the impact of their activity on the ecological integrity of their environment. This awareness promotes environmentally friendly practices and thus the sustainability of reef socio-ecosystems. Unfortunately, the biodiversity of coral reefs is vulnerable to any form of human presence, and the state of coral reefs is threatened by the continuous increase in numbers of recreational users.

Beyond ecological sustainability, the intense use of an area can result in conflicts, either in the case of a single activity such as simply relaxing on very busy beaches, or because of the incompatibility between two practices, generally between fishing and water sports, or between boating and swimming, and jet-skiing. Public authorities have a significant role to play in ensuring the cohabitation of users for whom the overcrowding of the visited sites is an important

disturbance factor. Strategies for this could include the distribution of different activities over time and space, or the possibility of a "wilderness experience" although this would also increase visitor numbers to a certain extent.

## Future research related to development issues

In the areas where it can be assessed in New Caledonia, the level of pressures due to recreational uses may seem relatively low in comparison with other regions of the world. However, it is part of a rapidly changing demographic and tourist context and involves ecosystems that are particularly fragile and vulnerable to climate change (more frequent and intense tropical cyclones, warming of seawater, coral bleaching, etc.). The threats to coral ecosystems and the sustainability of their uses are therefore real and growing. Yet, the real magnitude of the cumulative effects of all these pressures on the state of the ecosystem and its functioning is poorly assessed because of their complexity. This is particularly true in the case of the effects of climate change or in lagoons facing anthropized zones, where the increase in pressures associated with recreational activities coincides with an increase in pressures from land-based sources.

In addition, recreational uses should be monitored in areas where strong demographic or tourist developments are taking place, or are expected, in order to better understand their impacts and evolution. These include the Koné region which has undergone recent economic development or the Loyalty Islands where cruise tourism is booming. The assessment of the ecosystem's state of health must be compared to the pattern of activities in order to identify the most vulnerable areas. This will involve identifying limits to practices based on the vulnerabilities of the surrounding environment. There is also a need to better understand the nature and motivations of users, in order to anticipate changes in their behavior following the introduction of new management measures that may modify their practices (e.g., shifting fishing effort out of the MPAs).

A better understanding of lagoon socio-ecosystems implies the consideration of an appropriate geographical scale. In New Caledonia, due to the mobility of users, their interactions, the

connectivity of ecosystems and also the diversity of the structures of environmental management, the entire New Caledonian territory must be taken into account. At this scale, harnessing the knowledge and expertise in a multidisciplinary approach that combines environmental sciences and the human and social sciences - disseminated to decision-makers and civil society - should enhance the anticipation of the environmental and economic consequences of development policies.

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