Chapter 40

Seabirds as sentinels of New Caledonian waters

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Juvenile masked booby *(Sula dactylatra)* © M. Junker

With several hundred islets scattered like confetti over a vast oceanic and lagoon area, the coral reefs of New Caledonia provide exceptional nesting sites for a diverse and abundant seabird community (chap. 20). Seabirds are one of the world's most threatened animal groups and their risk of extinction is increasing faster than any other bird group. Seabirds are valuable bio-indicators of the direct and indirect impacts associated with human activities, both on land and at sea. This is because most of these species are long-lived and share their existence between their terrestrial breeding colonies (particularly on coral cays) and the sea (for foraging and during inter-nuptial periods). They are major predators positioned at the top of the marine food chain. In addition, because of their sensitivity to environmental changes and disturbances, which affect feeding and breeding sites, environmental managers consider them as "sentinel species", capable of informing on the condition of natural marine and island areas.

They also represent interesting "umbrella species": while the conditions for their sustainable conservation can be met (e.g., MPAs), their high ecological requirements, particularly in terms of habitat quality and surface area, mean that they can, in turn, benefit a wide range of other species, communities and ecosystems. In New Caledonia, the importance and diversity of coastal and island environments, and the quality and size of lagoon and ocean ecosystems, mean that the seabird community is both numerically

very large and diverse in terms of species, but also faces major conservation challenges due to the presence of threatened species. Nonetheless, the seabirds of New Caledonia's coral cays face a variety of threats associated directly or indirectly with human activities.

At nesting sites, seabirds are impacted by introduced animal species, including rodents such as the black rat, Polynesian rat or domestic mouse, which prey on eggs and chicks, or invasive ants such as the electric ant which inflict severe stings. Their breeding habitat is also altered by the introduction of different plant species. The seabird community is highly sensitive to disturbances caused by visitors and to the sometimes devastating consequences of tourist developments. Past operations, such as the industrial exploitation of guano on some islands of the d'Entrecasteaux and Chesterfield reefs have also had a lasting negative impact. More recently, new questions have emerged on the possible effect, in the near future, of rising sea levels and more frequent flooding on the availability and quality of seabird breeding grounds on low coral cays. These issues are complex because coral cays and islets are not "passive" geological features. Their evolution over time depends on complex sedimentary and physical processes.

At sea, the threats may seem more diffuse but they are very real. They include changes in the oceanic environment, such as changes in food availability caused by climate change, pollution and biocontamination that particularly affect the physiology of higher predators (heavy metals, pesticides), or even the ingestion of plastic debris or accidental catches by fishing gear. Seabirds have to deal with a dense array of modern threats, the severity of which is still insufficiently documented in New Caledonia and requires further research.

While basic scientific knowledge is being developed for some of New Caledonia's coral reef seabird species, there are still important gaps. Several research programs, recently launched or under development, should be able to fill in these gaps. To name only two: the BIOPELAGOS program, supported by the SPC, IRD and CNRS, is currently aimed at better understanding the use of New Caledonia's oceanic environment by the seabird community. This program combines the monitoring of seabird movements using miniature electronic devices, with the analysis of the characteristics of ocean habitats preferred for foraging and the study of their diet using different methods (regurgitation analysis, determination of nitrogen and carbon stable isotopes, and DNA barcoding of feces). Other scientific programs aim at filling gaps in knowledge about the communities, numbers, reproduction and demographics of seabirds found on some remote islands; to better understand the reproductive biology of different species (many of which have been studied very little); or to clarify the extent of land-based threats such as invasive species or changes in the environment. All these data will contribute to a database implemented by the IRD, which will be made available to environmental managers to improve the sharing of knowledge and data. This should contribute to the sustainable and informed management of the exceptional biological heritage of New Caledonian waters.

Pair of Lesser frigatebird *(Fregata ariel)*. This species is particularly sensitive to human disturbance, which explains why it seeks isolated sites. Mouillage Islets, Chesterfield, April 2017. © IRD/E. Vidal

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