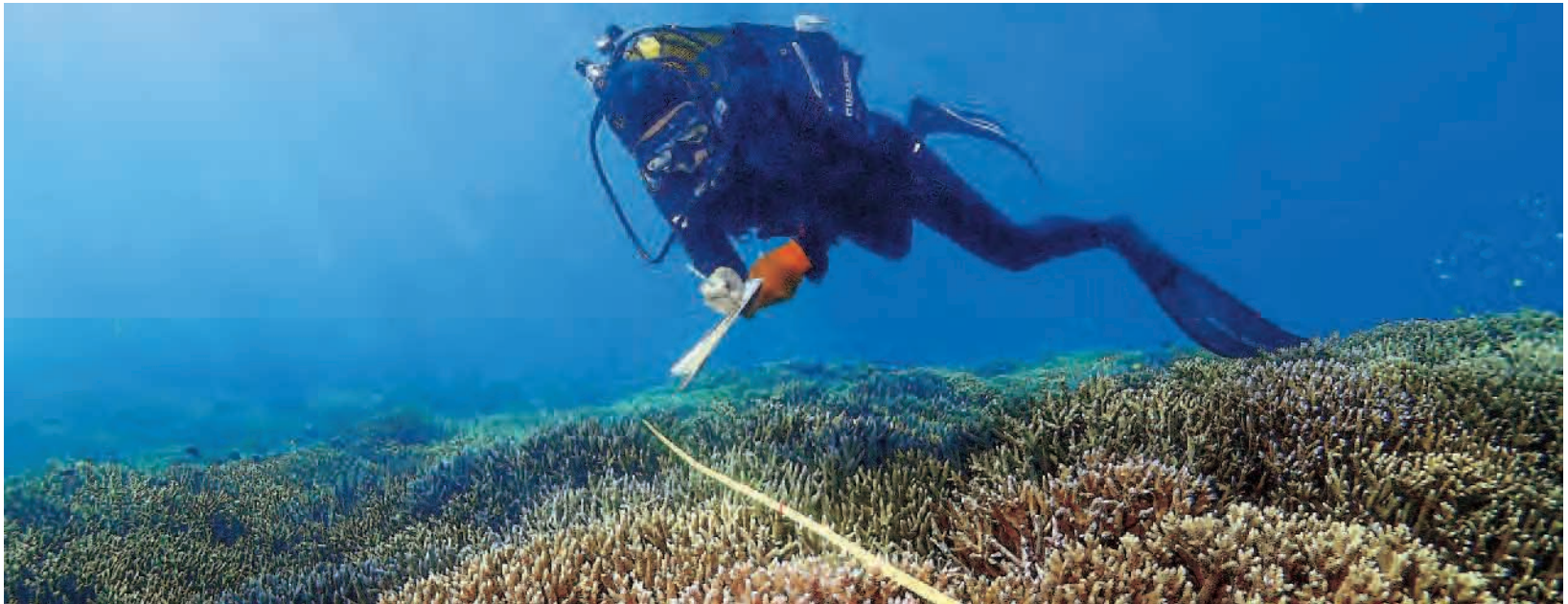


Inventory of reef biodiversity for knowledge sharing

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Scuba diving survey at Larégnère Reef, March 2017. © IRD/S. Andréfouët

In 2006, IFRECOR (French Coral Reef Initiative) launched an interdisciplinary program on the biodiversity of French overseas coral reefs. From 2008 to 2016, this project was managed by the French overseas delegation at the National Museum of Natural History in Paris (MNHN) and implemented by the Natural Heritage Service (SPN). It aimed to collect all data available on reef biodiversity in the French overseas territories and make it available to as many people as possible on a website dedicated to the “National Inventory of Natural Heritage” (INPN³).

³ <http://inpn.mnhn.fr>

⁴ <https://inpn.mnhn.fr/telechargement/referentielEspece/referentielTaxo>

Major progress on the inventory of reef biodiversity

In 2006, information on reef biodiversity in French overseas territories was very scattered and there was no data available on the biodiversity of French coral reefs. By 2016, over 24,000 marine species records, available for all overseas territories with coral reefs, were included in the French taxonomic register TAXREF (V10⁴) developed for INPN, thanks to IFRECOR. However, this impressive figure is only a small part of the total number of existing species.

Thanks to this program, distribution maps have been updated for many species and nearly 300,000 occurrence data have been added to the INPN databases. All these data are accessible on the INPN website and have also been forwarded to GBIF (Global Biodiversity Information Facility⁵).

IFRECOR's final report provides a summary of the results obtained in 2015 for each overseas territory (VANDEL *et al.*, 2016). This work was only made possible through several partnerships with scientific experts and coral reef managers, the work of two successive project managers at the Museum's overseas delegation (Julien Ringelstein and Éléonore Vandel) and the involvement of the SPN team who implemented it, particularly Olivier Gargominy (in charge of TAXREF at SPN).

Focus on New Caledonia

The coral reefs of New Caledonia represent 50% of the French reef area and are exceptionally diverse geomorphologically. The 1,600 km long barrier reef is the second largest barrier reef in the world after the Australian Great Barrier Reef and in some places, a double or even a triple barrier reef can be observed. New Caledonia also has 400 km² of seagrass beds and about 260 km² of mangroves. In 2008, parts of the reefs and lagoons have been listed as UNESCO World Heritage sites.

Species lists

The marine species of New Caledonia were listed in 2007 in the *Compendium of marine species from New Caledonia* (PAYRI and RICHER DE FORGES (EDS), 2007), published by the IRD and produced in collaboration with many partners. Over 50 taxonomists were involved in this work and 43 large species groups were documented although the species lists of some of these groups have since been updated. Research carried out at the IRD has produced additional lists of algae species (works by Claude E. Payri), foraminifers and scleractinians (works by Francesca Benzoni in collaboration with M. Michel Pichon), crustaceans (in collaboration with IRENav, *Institut de recherche de l'école navale*), and fish (works by Michel Kulbicki, in

⁵ www.gbif.org

⁶ <https://inpn.mnhn.fr/espece/jeudonnees/37> ou <http://lagplon.ird.nc>

collaboration with the University of New Caledonia and the Stuttgart Museum of Natural History). The Paris Museum (MNHN) regularly updates its species lists, including mollusks (330 species new to science between 2007 and 2015) and pursues its work on fish parasites.

Zoom in on algae

The Compendium of Marine Species of New Caledonia listed 443 species of macro-algae in 2007. This list was subsequently expanded to 500 species in TAXREF using recent publications and additional IRD data (Lagplon⁶). A number of new species have been described (e.g., *Sebdenia cerebriiformis*, N'YEURT and PAYRI, 2008) from various locations in the Southwest Pacific, including New Caledonia.

Species distribution

LAGPLON is an Indo-Pacific marine biodiversity data collection, part of the IRD research center in Nouméa. It contributed nearly 5,000 data on approximately 1,000 species of benthic flora and fauna recorded from New Caledonia's coastal waters to the INPN database (box 18).

A collaboration with the IRD also enabled Michel Kulbicki and his research team to integrate and make available all their data on fish occurrence collected between 1984 and 2005. In total, nearly 160,000 data on about 1,000 fish species are now available online and over 25,000 occurrence data from the MNHN collections have also been released (mollusks, echinoderms and crustaceans).

Data from the Pacific Regional Oceanic and Coastal Fisheries Development Program of the SPC (Pacific Community) added 10,800 fish and 7,000 marine invertebrate observations to the French inventory.

Lastly, the data collected in 2001 during the Rapid Assessment Protocol of the Diahot region (northern New Caledonia, WWF and EPHE) made it possible to update the distribution maps of more than 700 scleractinian and fish species.

Box 18

Sylvie Fiat and Claude E. Payri

The 1970s saw the start of hyperbaric diving at the ORSTOM research center in Nouméa (now IRD). The biologist divers of ORSTOM were about to introduce scientists to the astonishing marine biodiversity of the reefs and lagoons of New Caledonia. This journey truly started with the pharmaco-chemical program "SNOM" (Natural Substances of Marine Origin) in 1977 followed by "SMIB" (Natural Substances of Biological Interest) in 1982, and the growing oceanographic vessel fleet: Le Vauban and La Santa Maria in 1976 and Le Dawa in 1977.

With the arrival of the research vessel *Alis* in 1987, surveys intensified and provided many specimens which then became reference collections. These collections are still studied today by an international network of taxonomists and are partly housed at the Muséum National d'Histoire Naturelle (MNHN) in Paris and at the IRD research center in Nouméa. From the beginning, the very passionate and involved divers recorded all their observations in logbooks and created an extremely rich bank of images, first on films and later digital. Very early on, they also created a database called "LAGPLON".

60 years later, knowledge has evolved and accumulated. Most species have been identified by taxonomists and published in various volumes of the Fauna and Flora collection of the IRD (formerly ORSTOM) and numerous scientific journals. After the remarkable work of updating all the data, including the digitization of thousands of photographs and the development of a website, the 20,000 specimens in the collection and the 25,000 georeferenced underwater observations are now accessible in a few clicks through interactive maps and modern search engines.

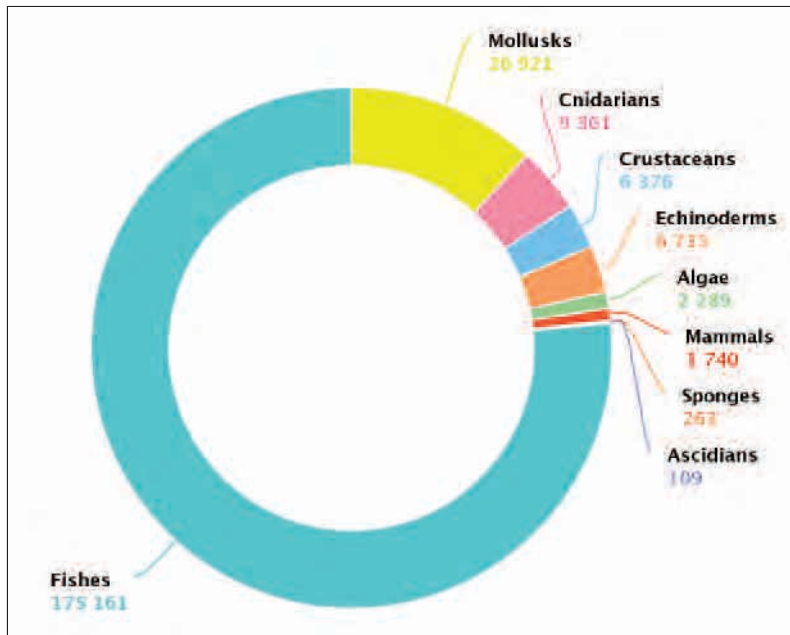


The first biological surveys using scuba began aboard La Santa Maria, commissioned in 1975. They continued with Le Vauban (A), a 24.5 m long trawler equipped for fisheries and hydrology programs, which arrived in Nouméa in 1976. The new vessel Dawa (B), an 11 m long trawler acquired in 1977, marked a particular turning point for diving exploration in the lagoon and reef environments of Grande Terre. Alis (C), a 28.40 m long vessel, took over in 1987 and still navigates beyond the New Caledonian EEZ.

A: © B. Delacroix/IRD; B: © M. Monzier/IRD; C: © S. Andréfouët/IRD



The data compiled in LAGPLON provide information on species and their distribution. Here, an example of a hard coral species. © LAGPLON



Number of marine data available for New Caledonia per taxonomic group.
Adapted from INPN, November 2017

Perspectives

A few taxonomic groups, such as annelids or hydrozoans, are still little known in New Caledonia. Many areas have not been surveyed and the knowledge of marine invertebrates is still incomplete. With this in mind, since 2016 the "Our Planet Reviewed" program, led by the French National Museum of Natural History, has launched a series of scientific expeditions to carry out an inventory of New Caledonia's "neglected" biodiversity. The program involves many New Caledonian, national and international partners.

Increasing the cooperation between the PAtriNat UMS, a unit dedicated to natural heritage expertise, and most French data-producing organizations is also contributing to the national inventory (INPN) at a rate of over 5 million occurrences per year, as measured by the French National Observatory for Biodiversity indicator (ONB)⁷.

Today, taxonomic studies are still ongoing through various programs carried out by several teams including the Paris Museum (MNHN). The generalization of genetic analyses provides new insights on the extent of this biodiversity, revealing many new species. In Nouméa, special efforts are being directed at the study of regional macroalgae and hard corals. These two major groups represent significant digital collections with nearly 20,000 and 5,000 specimens, respectively. They are studied and processed in several doctoral and post-doctoral programs.

The historic collaboration of the IRD with MNHN has led to the publication of LAGPLON data at the national level and international level: in 2012 in the National Inventory of Natural Heritage (INPN) and since 2015 in the Global Biodiversity Information Facility (GBIF). New Caledonia's marine biodiversity data are also recorded in databases established by other research teams. LAGPLON is linked to these databases and makes these data available to the public.

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⁷ <http://indicateurs-biodiversite.naturefrance.fr/indicateurs/evolution-du-volume-de-donnees-disponibles-sur-la-biodiversite#overlay-context=les-travaux-de-lonb-a-lechelle-locale>

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