10. The ecosystem approach: the fisheries' silent revolution

Philippe Cury and Didier Gascuel

Fishing has a direct impact on the resources being exploited, but also indirect effects on other species and on marine habitats. Overexploitation of predator fish (tuna, cod, grouper...), or sharks, results in unstable ecosystems. Forage fish such as sardines, anchovies or herring are caught in large quantities but are lost prey for predators including birds, mammals or larger fish. On the other hand, discarding of non-marketable species impact marine biodiversity. Finally, dredging and trawling damage the seabed and have significant effects on the health status of ecosystems. To be added to the ecosystem impacts of fisheries, are other anthropogenic impacts, including the destruction of certain habitats (regression of wetlands or mangroves) and biological pollution (invasive species, cf. VI.8). Climate change also affects the dynamics of marine resources (cf. VI.3). The distribution area of many species is shifting towards the poles under global warming, while ocean acidification is destroying corals and altering plankton productivity (cf. II.9). Ultimately, it is the overall properties of ecosystems that may be affected, including productivity, functional biodiversity and resilience.

The ecosystem approach to fisheries aims to reconcile biodiversity conservation, fishing activities that respect all the components of ecosystems and habitats, while maintaining catches and jobs at a high level. a) Colony of Acropora pulchra. © A. KOK. b) Fish for bouillabaisse on the Old Port of Marseille. © R. SMALLKAA. c) The 'Pierre Alain Atao' sardine boat entering the Concarneau seaport. © Pline. ■

Reconciling exploitation and conservation

A global vision recently imposed itself along with the Ecosystem Approach to Fisheries (EAF): the sustainable exploitation of resources, respectful of marine ecosystems. The EAF promises to reconcile the exploitation and conservation of all species, based on the ecosystems, now recognized as the appropriate scale for the integration of scientific knowledge and for management. The EAF emerged with the 1992 Rio Declaration (Agenda 21) and the FAO Code of Conduct for Fisheries in 1995. The role and importance of the EAF was recognized by 47 countries at the Conference on Responsible Fisheries in Marine Ecosystems held in Reykjavík in October 2001.

The EAF now has very direct impacts on fisheries management in some countries including South Africa, Australia, and the United States. In Europe, it is included in the texts of the Common Fisheries Policy (CFP), but the implementation process is slow and tentative. For the past 50 years and still today, fisheries management has been based on scientific advice, which is based on a 'single-species' approach. Fishing quotas are calculated on a stock-by-stock basis (for North Sea cod, Bay of Biscay anchovy...), seeking to ensure the ecological sustainability of each species, but ignoring the complexity of marine ecosystems.

The EAF is, or should be, a process of continuous improvement that changes our relationships with nature and with the governance of the oceans. The international commitments made at the World Summit on Sustainable Development in 2002 in Johannesburg or at the convention on biodiversity in Nagoya in 2010 require countries to '*incorporate ecosystem considerations in fisheries management*.' In concrete terms, the countries pledged to restore collapsed fish stocks if possible by 2015, or by 2020 at the latest, and to establish a network of marine reserves covering at least 10% of the ocean surface area by 2020.

European directives also refer to the need to '*minimize the impact of fishing on ecosystems*.' Behind this expression is actually a major issue. In the face of the complexity and unpredictability of ecosystems, it is necessary to implement a precautionary approach that not only defines maximum permissible impacts, but develops a culture of continuous research for a minimum impact. This concerns, for example, the optimization of catch sizes, fishing technologies, fishing seasons and fishing areas. Overall, it is possible to fish better, or even more, but by impacting less.

The role of science

The role of research is a key in the implementation of the EAF. For scientists responsible for formulating advice and management recommendations, this approach leads to a profound renewal of the fields of research. It is no longer a matter of analyzing and modeling the dynamics of exploited stocks, but of understanding the multiple interactions that determine the functioning of marine ecosystems and exploitation systems. Major scientific advances have been made in recent years in the ecology of interactions. Scenario building for the evolution of socio-ecosystems in the context of climate change has been revolutionized by new modeling techniques. Ecosystem simulation models that combine climate change, changes in the biogeochemical productivity of the oceans and exploitation of human populations are also being developed with fine three-dimensional spatial and temporal resolution. The approaches 'indicator' makes it possible to better evaluate the economic and ecological performance of the different fishing methods, with a view to fleet-based management. These scientific advances are powerful tools, but are still rarely used to improve the operational management of marine resources.

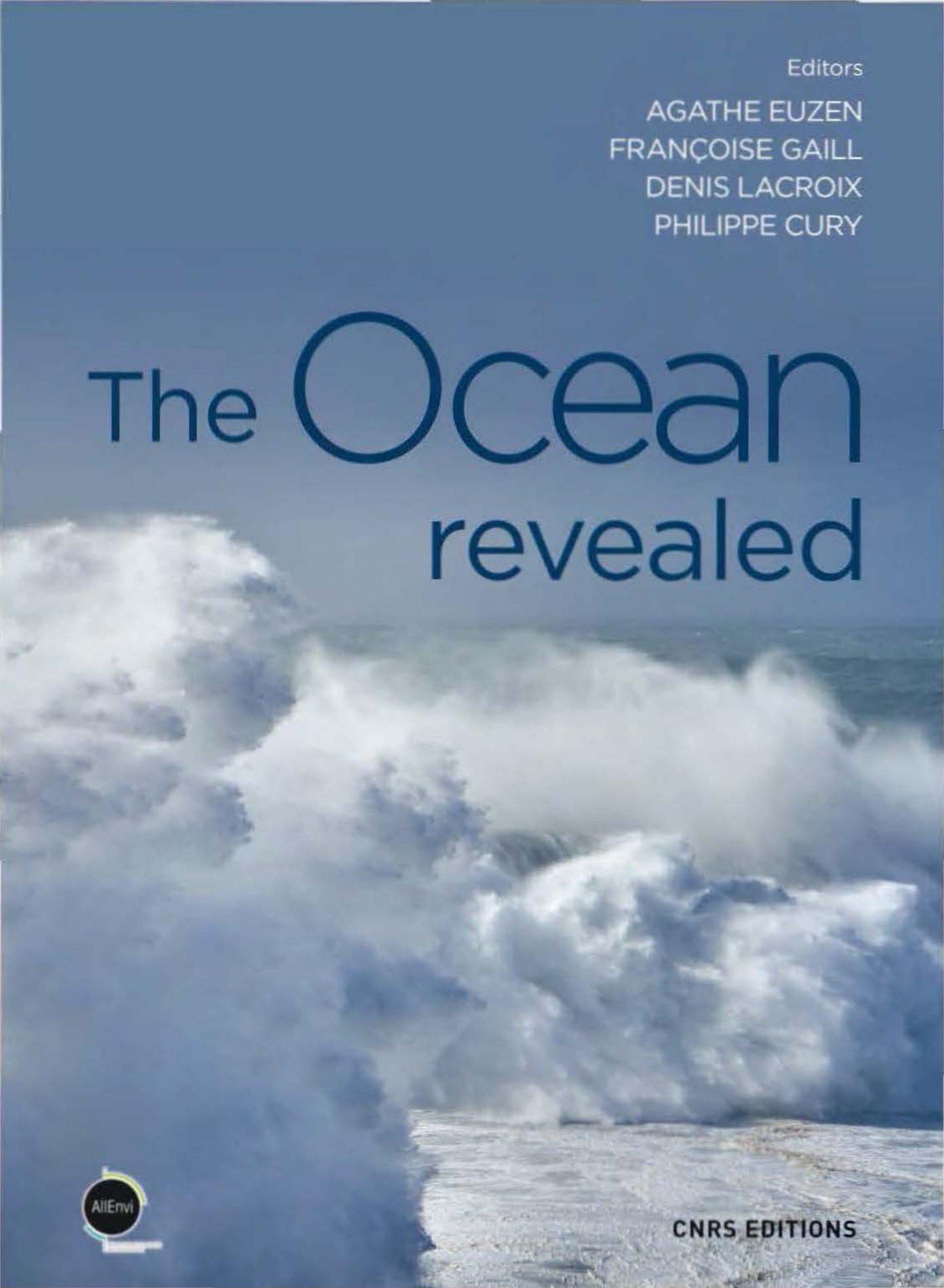
These complementary initiatives will make it possible to implement the ecosystem approach in an increasingly integrative framework and will enable the sustainable exploitation of marine ecosystems in a context of increasingly pressuring and complex issues.

References

- P. CURY and Y. MISEREY – *Une mer sans poissons*, Calmann-Levy, 2008.
- P. CURY and D. PAULY – *Mange tes méduses. Réconcilier les cycles de la vie et la flèche du temps*, Odile Jacob, 2013.
- D. GASCUEL – *Exploitation des ressources marines : quand la crise écologique compromet l'alimentation des pays du Sud*, Revue POUR, Le défi alimentaire du XXIe siècle, Edition GREP, n° 202-203, 2009.
- D. GASCUEL – *L'approche écosystémique des pêches, une condition pour l'exploitation durable des océans*, Revue POUR, Le défi alimentaire du XXIe siècle, Edition GREP, n° 202-203, 2009.

Editors
AGATHE EUZEN
FRANÇOISE GAILL
DENIS LACROIX
PHILIPPE CURY

The Ocean revealed



CNRS EDITIONS

Acknowledgements

We have received a great deal of support, without which we could never have produced this book. We would like to thank the chairman and members of the AllEnvi research alliance for their backing of the project, and the executive secretariat of AllEnvi for their assistance, the CNRS Ecology and Environment Institute for their precious support and the scientific communities at the various research performing organizations involved.

The publication's coordinators also express their warmest thanks to the members of the editorial committee for all their hard work and responsiveness, and to all the contributors for their enthusiasm in sharing their knowledge, even within some very tight deadlines! The English version could not have been produced without the efficiency and meticulousness of the translators. The coordinators would also like to thank CNRS Éditions who have provided their support throughout the publication process. Finally, this book could not have been published without the energy and professionalism of Elsa Godet, who threw herself into the challenge of producing the book in both languages.

Steering Committee

Multidisciplinary Editorial Committee

Editorial and graphic design:
Elsa Godet (www.sciencegraphique.com)

Translation:
Morris Traduction (www.andrewmorris.fr) and Daphne Goodfellow
p. 166 Graham Maclachlan (Mactrad)

ISBN: 978-2-271-11907-0