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TITLE: Operationalizing risk-based cumulative effect assessments in the marine environment

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ABSTRACT:

Ecosystem-based management requires an assessment of the cumulative effects of human pressures and environmental change. The operationalization and integration of cumulative effects assessments (CEA) into decision-making processes often lacks a comprehensive and transparent framework. A risk-based CEA framework that divides a CEA in risk identification, risk analysis and risk evaluation, could structure such complex analyses and facilitate the establishment of direct science-policy links. Here, we examine carefully the operationalization of such a risk-based CEA framework with the help of eleven contrasting case studies located in Europe, French Polynesia, and Canada. We show that the CEA framework used at local, sub-regional, and regional scales allowed for a consistent, coherent, and transparent comparison of complex assessments. From our analysis, we pinpoint four emerging issues that, if accurately addressed, can improve the take up of CEA outcomes by management: 1) framing of the CEA context and defining risk criteria; 2) describing the roles of scientists and decision-makers; 3) reducing and structuring complexity; and 4) communicating uncertainty. Moreover, with a set of customized tools we describe and analyze for each case study the nature and location of uncertainty as well as trade-offs regarding available knowledge and data used for the CEA. Ultimately, these tools aid decision-makers to recognize potential caveats and repercussions of management decisions. One key recommendation is to differentiate CEA processes and their context in relation to governance advice, marine spatial planning or regulatory advice. We conclude that future research needs to evaluate how effective management measures are in reducing the risk of cumulative effects. Changing governance structures takes time and is often difficult, but we postulate that well-framed and structured CEA can function as a strategic tool to integrate ecosystem considerations across multiple sectorial policies.

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