

OCEANS

Avoiding Empty Ocean Commitments at Rio+20

Liane Veitch,^{1*} Nicholas K. Dulvy,² Heather Koldewey,¹ Susan Lieberman,³ Daniel Pauly,⁴ Callum M. Roberts,⁵ Alex D. Rogers,⁶ Jonathan E. M. Baillie¹

The principles of sustainable management of marine capture fisheries and the protection of biodiversity are established by the United Nations Convention on the Law of the Sea (UNCLOS) and its implementing agreement (1). Building on these, Agenda 21, released after the UN “Earth Summit” in 1992 in Rio de Janeiro, and the Johannesburg Plan of Implementation (JPOI) from the 2002 summit, set quantitative and qualitative targets relating to the marine environment (see the table). Unfortunately, implementation of many of these commitments has been difficult, ineffective, or practically nonexistent.

In June 2012, heads of state and government will meet at the UN Conference on Sustainable Development (“Rio+20”) to renew political commitments to sustainable development and to identify gaps from previous Earth Summits. Oceans are one of ten “critical issues” at Rio+20; therefore, it is timely to revisit existing fisheries commitments and to review evidence of their implementation and success (2). We discuss fisheries-related actions to evaluate progress across five areas: improving fisheries management; decreasing harmful subsidies; eliminating illegal, unreported, and unregulated (IUU) fishing; increasing marine protection; and decreasing biodiversity loss.

Sustainable management

Fishing capacity has declined in some countries (3), although, globally, fishing capacity has increased since the JPOI target was set from 4.02 billion kilowatt days in 2002 to 4.35 billion in 2010 (4), which indicates that the target to reduce overcapacity by 2005 was not achieved. Global fisheries catches are between 17 and 112% higher than what could be sustainably appropriated from shelf ecosystems on the basis of estimates



of primary production (5), and the proportion of assessed stocks classified as overexploited, depleted, or recovering from depletion reached 30% in 2009 (6). These findings suggest that, in general, both unilaterally and acting through regional fisheries management organizations and agreements, governments will fail to meet their commitments to maintain or restore stocks to maximum sustainable yield (MSY) (7) either regionally [e.g., (8)] or globally by 2015 (9). Although a few countries have improved management of their domestic stocks (10), there are concerns that in some cases this has displaced overfishing to less well regulated fisheries in distant waters (often of developing countries) or led to the sourcing of fish from harmful forms of aquaculture (11).

The Ecosystem Approach to Fisheries (EAF) was adopted as a policy goal before the availability of a tested framework for implementation (12, 13); therefore, development of the EAF has proven challenging and contentious (14). Even where relatively sophisticated management systems exist, consensus is generally lacking regarding the metrics or tools to apply the EAF (15). One indicator that we are not achieving even a minimal EAF within the target time frame is the low proportion of stocks managed by using precautionary reference points and inadequate implementation of even nonbinding national plans of actions, such as that for sharks (16). Nonetheless, progress has been made in the past decade on the meaning and practical use of the EAF [e.g., (13, 17)], and initiatives such as the European Union’s

To improve sustainability of ocean ecosystems, implementation of existing commitments should be prioritized.

Marine Strategy Framework Directive are beginning to show promise (18).

Subsidies

Awareness of harm caused by subsidies has increased, and the issue is now on the agenda of international institutions such as the World Trade Organization (WTO) and major non-governmental organizations (NGOs). Even so, a decade after being tasked with reducing global capacity-enhancing subsidies, worth U.S. \$16.2 billion in 2003 (19), the WTO has failed to achieve the required consensus (20), despite intense advocacy by environmental NGOs and the support of numerous countries. Harmful subsidies should be phased out by a set date or redirected into beneficial fisheries management plans by governments that choose to continue to provide subsidies.

IUU fishing

The International Plan of Action (IPOA) on IUU fishing continues to be voluntary and has not halted illegal fishing (21), which continues to be worth up to U.S. \$23 billion per year (22, 23). Ubiquitous IUU fishing undermines fisheries management; increases risks to target and by-catch species; steals profits from legitimate fishers and governing bodies (21); and is especially pervasive where chances of detection or penalty are low and benefits are high, e.g., along West Africa’s coast (24). Focus on the “I” of IUU, has obscured the “UU”; the bulk of fisheries catches, at least in developing countries, are landed by small-scale fisheries that remain unreported and unregulated, and their true value in national

¹Zoological Society of London, London NW1 4RY, UK. ²Simon Fraser University, Burnaby, British Columbia V5A 1S6, Canada. ³Pew Environment Group, Washington, DC 20004, USA. ⁴University of British Columbia, Vancouver, British Columbia V6T 1Z4, Canada. ⁵University of York, York YO10 5DD, UK. ⁶University of Oxford, Oxford OX1 3PS, UK.

*Author for correspondence: E-mail: liane.veitch@zsl.org

accounting and poverty alleviation goes unrecognized (25).

Initiatives such as the Food and Agriculture Organization of the United Nations (FAO) Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing to monitor vessels where they land fish (26) and the Partnership for African Fisheries to fight IUU at the regional level are encouraging developments. In addition, widespread monitoring, control, surveillance, and enforcement of vessels at sea and increased uptake of catch and trade documentation schemes are required (27).

Marine protected areas

Marine protected areas (MPAs), particularly strict “no-take” zones, confer multiple ecosystem and societal benefits, such as rebuilding fish stocks and improving fisheries yields, restoring biodiversity and habitat quality, improving resilience to environmental or human pressures, and contributing to local poverty alleviation (28–31). In 2010, about 7.2% of territorial waters and 1.6% of the total ocean was classified as protected (32). The strength of protection for many designated areas is questionable, however, and needs improvement (33). The recent creation of very large marine reserves around remote unpopulated islands, such as the Chagos Archipelago, the Northwestern Hawaiian Islands, and South Orkney Islands are encouraging developments, although beyond territorial waters there is presently little or no protection (34).

Despite the commendable increase in MPA designation, at the current rate, the 2012 target will not be met. As suitable places for very large MPAs are scarce, the rate of progress may decline as these “low-hanging fruit” become protected. Encouragingly, no-take reserves have increased markedly since the late 1990s (9), and although current coverage remains insufficient [e.g., (35)], we are moving in the right direction. For example, the Convention on Biological Diversity (CBD) has committed to protect 10% of marine areas by 2020 (extended from 2012 as that deadline passed) and the World Parks Congress has set the target of 30% by 2030.

Protection of marine biodiversity

Many populations have shown promising recovery at the local level after changes to management practices, often including the establishment of MPAs or changes to fish-

OUTCOMES RELEVANT TO OCEAN CONSERVATION AND FISHERIES MANAGEMENT

Agenda 21 and the agreement on the CBD (168 signatories), from the 1992 UN Conference on Environment and Development (attended by 172 governments)

Implement strategies for sustainable use of living marine resources through legal and regulatory frameworks, including small-scale artisanal fisheries.

Maintain biological diversity and productivity of marine habitats under national jurisdiction.

Protect critical habitat areas and highly biologically diverse and productive habitats, where appropriate.

JPOI from the 2002 World Summit on Sustainable Development (WSSD) (attended by 192 governments)

Sustainable management: Implement the FAO IPOA for the Management of Fishing Capacity by 2005 to address overcapacity; maintain or restore depleted fish stocks so they can produce MSY by 2015; eliminate destructive fishing practices and facilitate the use of the ecosystem approach to fisheries by 2012.

Subsidies: Eliminate harmful subsidies that contribute to overcapacity or IUU fishing.

IUU fishing: Implement the FAO IPOA to prevent, deter, and eliminate IUU fishing by 2004.

MPAs: Develop and implement a network of representative MPAs by 2012.

Biodiversity: Substantially reduce the rate of biodiversity loss at national, regional, and global levels by 2010; maintain the productivity and biodiversity of important and vulnerable areas within and beyond national jurisdiction.

Outcomes relevant to ocean conservation and fisheries management from the 1992 and 2002 UN Earth Summits. The desired state of the system was described in 1992, whereas targets for achieving this state were agreed in 2002 (which we sort according to the themes discussed in this paper).

ing practices (11). However, global assessments of marine biodiversity [e.g., (36)] paint a bleak picture for many taxa; even the most cared for and most closely watched species—such as turtles, sharks, and coral reef fishes—are not safe. A substantial fraction (16%) of these charismatic marine animals is threatened with an elevated risk of extinction (37).

There has been progress in the protection of some groups of threatened marine birds, particularly albatrosses and petrels. Species such as wandering, black-browed, and gray-headed albatrosses and white-chinned petrels were in decline as a result of incidental mortality associated with long-line and trawl fishing. International collaboration (38) has resulted in technical mitigation measures and changes to fishing practices that have dramatically reduced by-catch in many fisheries (39), sometimes to almost zero [e.g., (40)]. Nevertheless, it is estimated that globally some 160,000 seabirds a year are still being killed as a result of by-catch from long-line fisheries alone (41), and the implementation of measures to protect seabirds is still far from adequate in many areas (42).

Because of the growing numbers of

exploited fish stocks and other marine species classified as Threatened or Endangered on the International Union for the Conservation of Nature (IUCN) Red List (43), it is widely acknowledged that the commitment to maintain biodiversity and productivity in vulnerable areas both within and beyond national jurisdiction and to reduce the rate of biodiversity loss has not been achieved [e.g., (44, 45)]. However, there is some good news. For example, a campaign for a global moratorium on high-seas bottom trawl fishing, which can destroy fragile habitats (46) and deplete slow-growing and long-lived species that are highly vulnerable to overexploitation (47) achieved a UN resolution in 2006 to ban the method in sensitive sea-bed areas by 2008 (48, 49). Although promising, this resolution has yet to be implemented widely and the future trajectory of high-seas protection remains unclear (50, 51). Unless implementation improves, ocean biodiversity risks enduring an extended phase of marine population crashes and species extinctions that has already begun (52).

Future commitments and action

Although many of the fisheries commitments made at previous Earth Summits will not be met by target dates, we are making progress in some areas, and solutions do exist. Public engagement is increasing governmental mandate through initiatives such as “Hugh’s Fish Fight” in Europe and awareness-raising movies like “The End of the Line,” “Finding Nemo,” and “Sharkwater.” Still, agreeing on, implementing, and enforcing science-based quotas and the use of sustainable fishing gear has proven difficult within individual countries, and getting many to agree at the multilateral level has caused significant delays. Obstacles such as strong interest-group opposition to commitments, including subsidy redirection and increased MPA coverage, have made it politically difficult to make necessary changes, especially as the benefits are unlikely to be felt before the next electoral cycle. Negotiating capacity reduction is particularly complicated; “everyone” agrees that capacity should be reduced, as long as it is from other countries’ fleets.

The complexity of problems and the politics of cooperation have been greater than anticipated. Targets and implementation

strategies need to be more nuanced and context-specific to be realistic and achievable. Overcoming current barriers to coordinated and large-scale implementation of targets should be a priority at Rio+20 (53–56).

We are calling on governments to honor their long-standing commitments to a sustainable marine environment, through (i) implementing a program to deliver the target of reducing global fishing effort to bring capacity in line with resources, both in domestic waters and in areas beyond national jurisdiction; (ii) redirecting harmful subsidies toward improved management and protection, for example, through allocating more resources to fight IUU and to establish MPA networks; and (iii) implementing even a minimal EAF that protects vulnerable species, while increasing the use of necessary single-species targets.

Rio+20 is also a real opportunity for governments to launch a negotiation process for a new implementing agreement under UNCLOS, seen as a key element for the protection and conservation of biodiversity on the high seas. Following the adage of what gets monitored gets managed, development of surveillance indicators for marine ecosystems must go hand in hand with and enhance implementation of these societal aspirations. Increased participation of fishers and other industry stakeholders is also a necessary and desirable objective in the process to achieve sustainable management. Continued failure to address these problems will incur greater environmental and socioeconomic risk and costs in the near future (52, 57).

Finally, numerous new ecological surprises have emerged in the last two decades that will further hinder progress toward achieving our goals. Ocean acidification, mass coral bleaching, disease outbreaks, invasive species, expanding marine dead zones, and dangerous climate change were not considered serious issues at the previous Earth Summits, although we now know they will increasingly threaten sustainable marine management (52, 57). Emerging ecological challenges such as these provide even greater incentive to avoid empty ocean commitments at Rio+20. The livelihoods of millions, the food security of billions, and the safe functioning of our planet's oceans are at stake.

References and Notes

- UN Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA).
- A number of other commitments have been made through different international political processes, such as the FAO Code of Conduct for Responsible Fisheries; FAO International Plan of Action for Managing Fishing Capacity; FAO International Plan of Action for the Conservation and Management of Sharks; FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing; FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries; UN Millennium Development Goals (MDGs); and CBD.
- FAO, *The State of the World Fisheries and Aquaculture 2010* (FAO, Rome, 2010).
- J. A. Anticamara, R. Watson, A. Gelchu, D. Pauly, *Fish. Res.* **107**, 131 (2011).
- E. Chassot *et al.*, *Ecol. Lett.* **13**, 495 (2010).
- Y. Ye, K. L. Cochrane, in *Review of the State of Marine Fishery Resources* (FAO Fisheries and Aquaculture Department, Rome, 2011), pp. 3–18.
- Also disturbing is the growing consensus among fisheries scientists that the MSY bar was set too low and that the exploitation rate that achieves MSY should be seen as an upper limit rather than a management target, lending more support to the general need to reduce exploitation levels.
- R. Froese, A. Proelß, *Fish. Res.* **11**, 194 (2010).
- Y. Ye *et al.*, *Fish. Res.* **10**, 0000/j.1467-2979.2012.00460.x (2012).
- R. Hilborn, *Ecosystems* (N. Y.) **10**, 1362 (2007).
- B. Worm *et al.*, *Science* **325**, 578 (2009).
- S. M. Garcia, K. L. Cochrane, *ICES J. Mar. Sci.* **62**, 311 (2005).
- H. Tallis *et al.*, *Mar. Policy* **34**, 340 (2010).
- J. Rice, *Mar. Ecol. Prog. Ser.* **300**, 265 (2005).
- M. Ruckelshaus, T. Klinger, N. Knowlton, D. P. DeMaster, *Bioscience* **58**, 53 (2008).
- E. J. Techera, N. Klein, *Mar. Policy* **35**, 73 (2011).
- S. L. Ellis *et al.*, *PLoS ONE* **6**, e18997 (2011).
- S. Jennings, J. Rice, *Fish. Res.* **12**, 125 (2011).
- U. R. Sumaila *et al.*, *J. Bioeconomics* **12**, 201 (2010).
- U. R. Sumaila, *Nature* **481**, 265 (2012).
- FAO–UN Environment Programme (UNEP) *Report of the FAO/UNEP Expert Meeting on Impacts of Destructive Fishing Practices, Unsustainable Fishing, and Illegal, Unreported and Unregulated Fishing on Marine Biodiversity and Habitats* (FAO Fisheries and Aquaculture, FAO, Rome, 2010).
- MRAG—Fisheries Ecosystem Restoration Research (FERR), *The Global Extent of Illegal Fishing* (MRAG Ltd. and FERR, University of British Columbia Fisheries Centre, Vancouver, 2008).
- S. Flothmann *et al.*, *Science* **328**, 1235 (2010).
- D. J. Agnew *et al.*, *PLoS ONE* **4**, e4570 (2009).
- D. Pauly, R. Froese, *Mar. Policy* **36**, 746 (2012).
- Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing; www.fao.org/Legal/treaties/037s-e.htm.
- A. Fabra, V. Gascón, M. Marrero, S. Lieberman, K. Sack, *Closing the Gap: Comparing Tuna RFMO Port State Measures with the FAO Agreement on Port State Measures* (Pew Environment Group, Philadelphia, 2011).
- Human Development Report Office, UN Development Programme (UNDP), Sub-Saharan Africa—The human costs of the 2015 'business-as-usual' scenario (Human Development Report Office, UNDP, New York, 2005).
- C. Toporova, I. Meliane, D. Laffoley, E. Matthews, M. Spalding, Eds., *Global Ocean Protection: Present Status and Future Possibilities* [Agence des aires marines protégées, Brest, France; IUCN, Gland, Switzerland; IUCN World Commission on Protected Areas, Washington DC, and New York, USA; UNEP–World Conservation Monitoring Center (WCMC), Cambridge, UK; The Nature Conservancy, Arlington, VA; United Nations University, Tokyo, Japan; World Conservation Society, New York, 2010].
- H. E. Fox *et al.*, *Conserv. Lett.* **5**, 1 (2012).
- G. R. Russ, A. C. Alcala, *Ecol. Appl.* **21**, 241 (2011).
- IUCN, UNEP–WCMC, *The World Database on Protected Areas* (UNEP–WCMC, Cambridge, 2011).
- L. Burke, K. Reyter, M. Spalding, C. Perrings, Eds., *Reefs at Risk: Revisited* (World Resources Institute, Washington, DC, 2011).
- B. C. O'Leary *et al.*, *Mar. Policy* **36**, 598 (2012).
- G. J. Edgar, *Aquat. Conserv. Marine Freshw. Ecosys.* **21**, 313 (2011).
- IUCN, Global Marine Species Assessment project; <http://sci.odu.edu/gmsa/>.
- L. McClenachan, A. B. Cooper, K. E. Carpenter, N. K. Dulvy, *Conserv. Lett.* **5**, 73 (2012).
- Coordinated through the Agreement on the Conservation of Albatrosses and Petrels program.
- L. S. Bull, *Fish. Res.* **10**, 408 (2009).
- J. P. Croxall, *Bird Conserv. Int.* **18**, (S1), S13 (2008).
- O. R. J. Anderson *et al.*, *Endanger. Species Res.* **14**, 91 (2011).
- J. P. Croxall *et al.*, *Bird Conserv. Int.* **22**, 1 (2012).
- IUCN, Red List Version 2011.2. (IUCN, Gland, Switzerland, 2011).
- S. H. M. Butchart *et al.*, *Science* **328**, 1164 (2010).
- G. M. Mace *et al.*, *Curr. Opin. Environ. Sustain.* **2**, 3 (2010).
- R. H. Thurstan, S. Brockington, C. M. Roberts, *Nature Commun.* **1**, 1 (2010).
- UN General Assembly (UNGA), Actions taken by States and regional fisheries management organizations and arrangements to give effect to paragraphs 83 to 90 of General Assembly resolution 61/105 on sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the UN Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments (64th Session of UNGA, A/64/305, 2009).
- UNGA, Actions taken by States and regional fisheries management organizations and arrangements in response to paragraphs 80 and 83 to 87 of General Assembly resolution 61/105 and paragraphs 113 to 117 and 119 to 127 of General Assembly resolution 64/72 on sustainable fisheries, addressing the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep-sea fish stocks (66th Session of UNGA, A/66/307, 2011).
- O. K. L. Drammeh, in *Illegal, Unreported and Unregulated Fishing in Small-Scale Marine and Inland Capture Fisheries* (FAO, Rome, 2000), pp. 135–144.
- Many conservation organizations and governments are calling for negotiation of a new implementing agreement under UNCLOS for the protection and conservation of high seas biodiversity. In December 2011, the UN GA, through its annual Oceans Omnibus Resolution, endorsed progress on this issue, and a number of governments are working to ensure progress on this agreement at Rio+20.
- A. D. Rogers, M. Gianni, *The Implementation of UNGA Resolutions 61/105 and 64/72 in the Management of Deep-Sea Fisheries on the High Seas: Report Prepared for the Deep-Sea Conservation Coalition, International Programme on the State of the Ocean (IPSO)* (IPSO, London, 2010).
- A. D. Rogers, D. A. Laffoley, *International Earth System Expert Workshop on Ocean Stresses and Impacts: Summary Report* (IPSO, Oxford, 2011).
- B. Cicin-Sain, M. Balgos, J. Appiott, K. Wolk, G. Hamon, *Oceans at Rio+20: How Well Are We Doing in Meeting the Commitments from the 1992 Earth Summit and the 2002 World Summit on Sustainable Development? Summary for Decision Makers* (Global Ocean Forum, University of Delaware, Newark, DE, 2011).
- Intergovernmental Oceanographic Commission of UNESCO (IOC–UNESCO), International Marine Organization, FAO, UNDP, *A Blueprint for Ocean and Coastal Sustainability* (IOC–UNESCO, Paris, 2011).
- Pew Environment Group, *RIO+20: Time to Turn Back the Tide* (Pew Environment Group, Philadelphia, 2011).
- U. R. Sumaila *et al.*, in *Green Economy Report* (UNEP, 2011), chap. 3; www.unep.org/greeneconomy.
- C. M. Roberts, *Ocean of Life: How Our Seas Are Changing* (Allen Lane, London, 2012).

Acknowledgments: We thank L. McRae and three anonymous reviewers for thoughtful and constructive input and acknowledge the support of all our institutions and funders including Selfridges' Project Ocean, the Natural Science and Engineering Research Council of Canada, and the Pew Charitable Trusts.

10.1126/science.1223009