

Evidence of bias in assessment of fisheries management impacts

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Melnychuk et al.'s comments in PNAS (1) that successful fisheries management requires the "capacity to limit fishing pressure" and "scientists are generally unanimous in calling for stronger management" echo comments made in many earlier publications. However, their conclusions about specific fisheries and management approaches lack credibility.

Their analysis relies on an opinion survey, using a nonrepresentative sample. For example, the seven New Zealand (NZ) respondents included three fishing industry employees or consultants, one person working for the Ministry for Primary Industries (MPI) and one person working for the agency responsible for stock assessment. The other two respondents remain anonymous.

Other NZ fisheries experts are much less optimistic, highlighting the lack of scientific data available to run the Quota Management System (QMS) (2). Most NZ stock assessments rely on catch/effort data provided by the industry rather than fisheries-independent surveys. This approach is known to be one of the reasons for consistent overestimation of Canadian cod stocks until they collapsed in 1992 (3). Very few fish stocks have targeted research surveys. Three quarters of QMS stocks have no formal stock assessment (4). For example, "estimates of reference and current biomass are not available" for warehou (*Seriolella brama*) (5). Funding for stock assessment is about 45% of levels in the early 1990s, whereas the number of QMS stocks has increased 3.5-fold (6).

Unintended consequences of fishing (e.g., unsustainable by-catch of endangered dolphins in inshore gillnet and trawl fisheries, sea lion by-catch in the trawl fishery) are just as important, but ignored. Most stock

assessments, in NZ and elsewhere, consider only the target species, ignoring wider ecosystem effects, even those impacting the target species.

Data on ecological impacts are inadequate for most NZ fisheries (2). For decades, government reports recommending increased observer coverage have been ignored. Current coverage is only 8.4% (4) and <1% in most inshore fisheries (7). An independent review of the MPI's handling of illegal fish dumping and dolphin by-catch (8) demonstrated industry capture of the regulator and revealed other serious problems. Widespread illegal dumping and misreporting have distorted catch statistics for decades (9, 10).

Fisheries management needs broadening beyond stock assessment and management actions to reduce fishing pressure so as to encompass more ecosystem-based objectives. Cultural perspectives are also important. For example, for NZ Māori, the "business of fishing" now largely means trading quota instead of their traditional role of guardianship over fisheries. Guardianship over the environment is very different from guardianship over quota rights.

In summary, Melnychuk et al.'s analysis (1) is not a trustworthy evaluation of the effectiveness of fisheries management. Given the strong bias in the NZ sample, it would be surprising if NZ was the only country for which there were problems with the selection of respondents. Instead of providing a robust analysis of the effectiveness of fisheries management, Melnychuk et al. (1) seem to be arguing for business-as-usual while ignoring broader issues, such as ecosystem impacts, environmental change, and social outcomes. Such an analysis does fisheries management no service.

- 1 Melnychuk MC, Peterson E, Elliott M, Hilborn R (2017) Fisheries management impacts on target species status. *Proc Natl Acad Sci USA* 114:178–183.
- 2 McKoy J (2006) Fisheries resource knowledge, management, and opportunities: Has the Emperor got no clothes? *New Zealand's Ocean and its Future: Knowledge, Opportunities and Management. Proceedings of a Conference Organized by the Royal Society of*

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New Zealand, Miscellaneous Series 70 (The Royal Society of New Zealand, Wellington, New Zealand), pp 35–44. Available at docs.niwa.co.nz/library/public/1877264229C.pdf. Accessed April 18, 2017.

- 3 Walters CJ, Maguire JJ (1996) Lessons for stock assessments from the northern cod collapse. *Rev Fish Biol Fish* 6:125–137.
- 4 Ministry for Primary Industries (2016) The future of our fisheries (Ministry for Primary Industries, Wellington, New Zealand). Available at <https://mpi.govt.nz/document-vault/14662>. Accessed April 12, 2017.
- 5 Ministry for Primary Industries (2016) Fisheries Assessment Plenary May 2016: Stock Assessments and Stock Status. Available at fs.fish.govt.nz/Page.aspx?pk=113&dk=24075. Accessed April 17, 2017.
- 6 Brady KB (2005) Ministry of Fisheries: Follow-up report on information requirements for the sustainable management of fisheries. Auditor General Report, June 2005 (Office of the Auditor-General, Wellington, New Zealand). Available at www.oag.govt.nz/2005/fisheries/ministry-of-fisheries-follow-up-report-on-information-requirements-for-the-sustainable-management-of-fisheries. Accessed April 18, 2017.
- 7 Clemens-Seely K, Hjørvarsdóttir FO (2016) *Conservation Services Programme, Annual Research Summary 2013-14* (Department of Conservation, Wellington, New Zealand).
- 8 Heron M (2016) Independent Review of MPI/MFish Prosecution Decisions: Operations Achilles, Hippocamp and Overdue. Available at <https://mpi.govt.nz/protection-and-response/environment-and-natural-resources/sustainable-fisheries/independent-review-of-prosecution-decisions/>. Accessed April 18, 2017.
- 9 Francis RICC, Gilbert DJ, Annala JH (1993) Fishery management by individual quotas: Theory and practice. *Mar Policy* 17:63–65.
- 10 Simmons G, et al. (2016) Reconstruction of marine fisheries catches for New Zealand (1950–2010). Working paper 2015-87 (Institute for the Oceans and Fisheries, University of British Columbia, Vancouver). Available at www.seaaroundus.org/doc/PageContent/OtherWPContent/Simmons+et+al+2016+-+NZ+Catch+Reconstruction+-+May+11.pdf. Accessed April 17, 2017.