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www.elsevier.com/locate/jeem

PII: S0095-0696(16)30262-5
DOI: http://dx.doi.org/10.1016/j.jeem.2017.01.001
Reference: YJEEM1998

To appear in: *Journal of Environmental Economics and Management*

Received date: 9 September 2016
Accepted date: 2 January 2017

Cite this article as: David M. Kling, James N. Sanchirico and Paul L. Fackler Optimal monitoring and control under state uncertainty: application to lionfish management, *Journal of Environmental Economics and Management* http://dx.doi.org/10.1016/j.jeem.2017.01.001

Optimal monitoring and control under state uncertainty: application to lionfish management[☆]

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Abstract

State variables in many renewable resource management problems, such as the abundance of a fish stock, are imperfectly observed over time. In systems characterized by state uncertainty, decision makers often invest in monitoring to learn about the level of a stock. We develop a stochastic bioeconomic model of marine invasive species management under state uncertainty. The decision maker in our model simultaneously evaluates optimal investment in monitoring and population control. Using a recently-devised method for solving continuous-state Partially Observable Markov Decision Processes (POMDPs), we find that the ability to learn through monitoring can alter the role of population control in the optimal policy function, for example by reducing control intensity in favor of monitoring. Optimal monitoring depends on the management context, including in our application lionfish population structure. The rich

[☆] We are grateful to our handling editor and two anonymous referees, whose comments and suggestions helped us improve the quality of this research significantly. For helpful feedback on earlier versions of this research, we thank Jay Abolofia, Yong Chen, Doug Larson, John Lynham, Lars Olsen, Mike Springborn, Jim Wilen, and seminar participants at the 2013 ASSA Meeting, University of California at Davis, University of Connecticut, University of Delaware, University of Maryland, and Oregon State University. Background research for this paper was enhanced by discussions with Lad Akins, Juan Agar, Dominique Lazarre, Catherine MacDonald, Vanessa McDonough, and James Morris Jr. Kling acknowledges generous support from a NOAA Fisheries/ Sea Grant Graduate Fellowship (#NA11OAR4170179). All errors in this paper are the responsibility of the authors.
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