Comment on the paper "The Evaluation of Fisheries Management: A Dynamic Stochastic Approach"

José M. Maroto
Department of Estadística e Investigación Operativa II.
Universidad Complutense, 28223 (Madrid), Spain.
PHONE: +34913942898, E-mail address: maroto@ccee.ucm.es

This paper develops a discrete time multifleet bioeconomic model with variability in fish dynamics (uncertainty in the growth function of the resource). In particular, this paper presents an alternative stochastic approach, based on the calibration technique, to reproduce the observed population dynamics of the resource. This stochastic approach, in which the random shocks follow a Markov process, has been implemented in different settings in the economic literature. Hence, the main contribution of this paper lies in the fact that it is applied to real fisheries. On the basis of data from the European Southern Stock of Hake (ESSH), the main predictions and policy recommendations are:

a. The estimated growth random shocks, which are based on Tauchen's method, reproduce the observed population dynamics of the resource quite well.
b. The present value optimizing policy (optimal policy) is not the standard constant-escapement policy. In particular, the optimal policy consists of applying a different exploitation rule depending on the stock level of the biomass.
c. The optimal policy shows that the ESSH has been managed in an inefficient way. In spite of the fact that the observed catches have been lower than would correspond to optimal exploitation, the observed exploitation rules for 1982-2002 have not been able to protect the resource due to the fact that the timing of captures has not been appropriate.
d. An ITQ system with quotas depending on the size and the productivity of the biomass is proposed. In particular, the artisanal fleet would buy all the permits, and consequently the trawler fleet would disappear, at optimal exploitation levels.

There are many interesting aspects to this paper, not only because of the results obtained, but also in view of the implicit future lines of research put forward.

It is well known that, in the absence of uncertainty and in a context of classical bioeconomic models with a linear production function (harvest function) on both effort and stock level, an optimal stationary equilibrium x* exists, and the optimal policy is a "bang-bang" solution (constant-escapement policy (CSP)): adjust the stock level toward x* as rapidly as possible. Beverton and Holt (1957), Schaefer (1957), Clark (1973, 1990), Spence (1973), Clark and Munro (1975), among others, have shown that, under fairly general conditions, a CSP is optimal, that is, the present value optimizing policy.

Beginning with Jaquette (1972) and Reed (1974), the most relevant literature on renewable resources management under uncertainty has extended the above result to stochastic models with one source of uncertainty. In Reed (1979), a CSP is shown to be optimal in a stochastic stock-recruitment model (uncertainty in growth) even in the case where the production function is non-linear for the stock level. Clark and Kirkwood (1986) consider Reed's model under uncertainty about stock in the current period (uncertainty in measurement). In this setting, they show that, in contrast to the conventional wisdom, the optimal harvest is less cautious than that obtained under a CSP for high enough levels of uncertainty. Roughgarden and Smith (1996) extend the previous models by considering uncertainties in growth, measurement, and harvest