Spatial Bioeconomics of Subsistence Hunting

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ABSTRACT

The thesis reviews the significance and prevalence of hunting as a threat process in conservation, and then presents simple, general models exploring the stability of hunted populations, building upon fundamental principles of population dynamics. The adoption of a bioeconomic approach emerges from this consideration of human responses, rather than a conventional economic focus on maximising rents. The behaviour of a generic spatial bioeconomic model is explored to examine the influence of parameters, and to challenge the universality of conclusions based on previous, more specific models.

A case study of the subsistence hunting of ibex in the North Tien Shan mountains, along the Kazakh-Kyrgyz border, is developed to test the application of the generic bioeconomic model. Its practicability is tested by its ability to predict the outcome of a complex harvesting simulation, in which the macro behaviour of the system is an emergent property of numerous, low-level biological and behavioural mechanisms. This approach has parallels with the use of operating models in fisheries management, but the emphasis is not on producing a plausible virtual ecology rather than an accurate model for the North Tien Shan. The simple model can produce a reasonable ballpark estimate with limited data, or a highly similar outcome with perfect knowledge. There are substantial difficulties in characterizing real systems, however, and even if all parameters are known at any point in time, it may be difficult to predict behaviour in other states.

The final section explores the wider relevance of bioeconomics to conservation, showing that its quantification of incentives provides a basis for evaluating different management option involving people. Economic analysis reveals fundamental weaknesses of conventional biological approaches. Even if informational requirements are too severe for accurate quantification, incorporating human decision-making into models can provide exploratory tools for assessing the appropriateness of different management options. At present, economics is the only option for so doing.

ABBREVIATIONS

AC	Average Cost
ACTED	L'Agence d'Aide à la Coopération Technique et au Développement – French development NGO
ANN	Artificial Neural Network
AO	*Aiyl Okmotu* – Kygyz village council
BM	Biomass
CA	Central Asia
CI	Confidence Interval
CPUE	Catch Per Unit Effort
CV	Coefficient of Variation
DFID	Department For International Development – UK development agency
GA	Genetic Algorithm
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Global Information System
ICAD	Integrated Conservation And Development
ING	Individual-based neural network genetic algorithm
INTAS	International Association – EU funding body for cooperation research with the Former Soviet Union
IUCN	World Conservation Union
LH/RH	Left-/Right-Hand
LHS/RHS	Left-/Right-Handside
MAS	Multi-Agent System
MC	Marginal Cost
MR	Marginal Revenue
MSY	Maximum Sustainable Yield
NABU	Naturschutzbund – German conservation NGO
*n*D	*n*-dimensional
NGO	Non-Governmental Organisation
NTFP	Non-Timber Forest Product
NTS	North Tien Shan
PA	Protected Area
PPP	Purchasing Power Parity
PRA	Participatory Rural Assessment
S&D	Supply and Demand
SD	Standard Deviation
SLT	International Snow Leopard Trust
UN	United Nations
UNDP	United Nations Development Programme
WWF	Worldwide Fund for Nature

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