



Research

Cite this article: Purcell SW, Polidoro BA, Hamel J-F, Gamboa RU, Mercier A. 2014 The cost of being valuable: predictors of extinction risk in marine invertebrates exploited as luxury seafood. *Proc. R. Soc. B* **281**: 20133296. <http://dx.doi.org/10.1098/rspb.2013.3296>

Received: 18 December 2013

Accepted: 6 February 2014

Subject Areas:

environmental science, ecology

Keywords:

threatened and endangered species, biodiversity conservation, fisheries management, anthropogenic Allee effect, opportunistic exploitation, valuable fauna

Author for correspondence:

Steven W. Purcell

e-mail: steven.w.purcell@gmail.com

Electronic supplementary material is available at <http://dx.doi.org/10.1098/rspb.2013.3296> or via <http://rspb.royalsocietypublishing.org>.

The cost of being valuable: predictors of extinction risk in marine invertebrates exploited as luxury seafood

Steven W. Purcell¹, Beth A. Polidoro^{2,3}, Jean-François Hamel⁴, Ruth U. Gamboa⁵ and Annie Mercier⁶

¹National Marine Science Centre, Southern Cross University, Coffs Harbour, New South Wales 2450, Australia

²International Union for the Conservation of Nature (IUCN) Marine Biodiversity Unit, Old Dominion University, Norfolk, VA 23529-0266, USA

³New College of Interdisciplinary Arts and Sciences, Arizona State University, Glendale, AZ 85306, USA

⁴Society for the Exploration and Valuing of the Environment (SEVE), Portugal Cove-St Philips, Newfoundland and Labrador, Canada A1M 2B7

⁵College of Science and Mathematics, University of the Philippines Mindanao, Mintal, Davao City 8022, Philippines

⁶Department of Ocean Sciences, Memorial University, St John's, Newfoundland and Labrador, Canada A1C 5S7

Extinction risk has been linked to biological and anthropogenic variables. Prediction of extinction risk in valuable fauna may not follow mainstream drivers when species are exploited for international markets. We use results from an International Union for Conservation of Nature Red List assessment of extinction risk in all 377 known species of sea cucumber within the order Aspidochirotida, many of which are exploited worldwide as luxury seafood for Asian markets. Extinction risk was primarily driven by high market value, compounded by accessibility and familiarity (well known) in the marketplace. Extinction risk in marine animals often relates closely to body size and small geographical range but our study shows a clear exception. Conservation must not lose sight of common species, especially those of high value. Greater human population density and poorer economies in the geographical ranges of endangered species illustrate that anthropogenic variables can also predict extinction risks in marine animals. Local-level regulatory measures must prevent opportunistic exploitation of high-value species. Trade agreements, for example CITES, may aid conservation but will depend on international technical support to low-income tropical countries. The high proportion of data deficient species also stresses a need for research on the ecology and population demographics of unglamorous invertebrates.

1. Introduction

Most countries have made slow progress in their global assignments to safeguard the Earth's biodiversity [1,2]. In an attempt to guide conservation efforts, research into attributes that predispose species to the risk of extinction has surged [3,4]. Extinction drivers are increasingly viewed as the combined effects of biological and anthropogenic variables. High-trophic level, large body size, low population density, slow life history (slow growth and late maturation) and small geographical range size are often the major biological drivers of extinction risk in marine species, in comparable importance to human-related factors such as habitat loss, over-exploitation, introduced species and chains of extinction [3,4].

In 1883, Thomas Huxley proclaimed the assumption that economic extinction (exploitation cessation) of marine species will precede ecological extinction because sparse populations are increasingly costly to exploit [4]. However, this notion has long been questioned [5]. Increased value can be attributed to rarity [6–8], thereby precipitating extinctions through the so-called anthropogenic Allee effect (AAE) [9]. Alternatively, valuable species can become rare from targeted exploitation arising from consumer preference, which can drive them to