A Population Survey of the West Indian Topshell (*Cittarium pica;* Trochidae) in the U.S. Virgin Islands

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The West Indian topshell, *Cittarium pica* (Trochidae), is an intertidal gastropod that is commonly harvested for food throughout the Caribbean. In the U.S. Virgin Islands, *Cittarium* is caught by commercial, recreational and subsistence fishers. However little is known about *Cittarium* population structure, making it difficult to assess the impact of harvest upon local populations. In order to provide baseline data for fisheries management, we conducted intertidal surveys of *Cittarium* populations on St. Croix, St. John, St. Thomas, and associated offshore cays of the USVI. Our results showed considerable site-to-site variation in *Cittarium* population structure: average density and size varied both within and among islands. At most sites, larger adult *Cittarium* (> 62 mm shell width) were either rare or absent, and generally at densities of < 0.2 individual/m^2. Inaccessible sites and sites within no-take areas had higher densities of large *Cittarium*. These data suggests that harvesting has impacted population size structure by removal of the largest individuals. The abundance of young-of-the-year *Cittarium* (< 10 mm shell width) varied substantially among sites, but high densities (> 10 individuals/m^2) were not uncommon. This observation indicates that *Cittarium* recruitment levels may be relatively high but are spatially localized. We identify and discuss factors that may contribute to spatial variability in *Cittarium* population structure (*e.g*. substrate composition, habitat topography, exposure to wave action). We conclude that harvesting and variable recruitment patterns are two of the most significant determinants of variable *Cittarium* size distributions in the USVI.

KEY WORDS: West Indian topshell, *Cittarium*, whelk, rocky intertidal, ecology, fishery

Un Muestreo de la Población de *Cittarium pica* (Trochidae) en los Islas Virgenes de los EE.UU

El caracol, *Cittarium pica* (Trochidae), también conocido como burgao, es un gastropod frecuentemente cosechado para comida en las aguas del caribe. En las islas Vírgenes de los Estados Unidos (USVI), el *Cittarium* se pesca para el comercio, recreación o para subsistencia. Sin embargo, poco se conoce acerca de la estructura de las poblaciónes del *Cittarium* por lo que resulta

difícil determinar el impacto que tiene la pesquería en las poblaciónes locales. De tal forma, hemos conducido estudios de las poblaciónes del *Cittarium* en las islas de Santa Cruz, Santo Tomas, San Juan y otros islotes pertenecientes a USVI. Obtuvimos resultados bastante variados entre las distintas localidades: el tamaño y densidad promedio varia entre localidades y dentro de una misma localización. En la mayoría de las localidades grandes *Cittarium* adultos (> 62 mm achura máxima) eran poco común, y generalmente con densidades menores de 0.2 individual/m^2. En las áreas en que el acceso es prohibido o restringido hay mayor densidad de *Cittarium* grandes. Estos datos indican que la pesquería ha impactado la estructura de la población del *Cittarium* por medio de la eliminación del individuo más grande. La abundancia del *Cittarium* joven del año (<10 mm anchura máxima) vario substancialmente entre localidades, pero densidades altas (>10 individuos/m^2) fueron común. Esta observación indica que los niveles del recrutamiento pueden ser relativamente alto, pero estan localizado esparcidamente. Indentificamos y discutimos los factores ecológicas que pueden contribuir a los variables esparcidos en las poblaciónes del *Cittarium* (*ej*. composición física del suelo, topografia del habitat, y exposicion del movimiento de las olas). Concluimos que la pesquería y patrones de recruitamiento variadas son dos de los factores principales en la estructura de los poblaciónes del *Cittarium* en el USVI.

PALABRAS CLAVES: Caracol, *Cittarium pica*, estructura de las poblaciónes, pesquería

Diagnostic of the Recreational Scuba Diving Activity in the Marine National Park of Fernando de Noronha, PE.

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This paper's main goal is to characterize recreational SCUBA diving activity in Fernando de Noronha National Marine Park, located in Pernambuco, Brazil. To analyze SCUBA diving activity and the operating conditions of the scuba diving operators, a team from the laboratory of submarine diving from UNIVALI accompanied these divers while observing the following criteria: behavior of the divers during dives, observing whether organisms were touched or disturbed; the diver's floatability and swimming skills; the conditions of vessels used for scuba diving operations, and the availability of safety and live saving equipment. Each individual diver was profiled and their own level of satisfaction was evaluated via a semi-closed questionnaire. In addition, data on SCUBA diving impacts on the marine environment was obtained and divers were given an opportunity to suggest solutions for these impacts. During the expedition to Fernando de Noronha we observed increasing levels of