

deep areas, and to leave sanctuaries free of any fishing. It has been extended this year from January to September. To enforce such various regulations is a heavy task which is very partially fulfilled. For example, it is possible to find *S. gigas*, sold in the market at week ends during the closed season and as well illegal size *S. gigas* without any reaction of the competent authorities. People have always a good reason to explaining why they do not comply with the regulation as they are not convinced of its usefulness and are not threatened by seizure and fines except on very special occasions.

Efforts to offer simple, reliable biological information as well to fishermen as to consumers have been developed for a good understanding of the scientific reason of legal constraints. Biological documents on the life of *S. gigas* are published and used for educational purposes. Several initiatives aim to educate the children between 10 and 14 years as they appear as the most receptive ones for environmental education. Amplification using television and radio broadcasting as well as local newspapers is used as frequently as possible, but it is difficult to evaluate the impact of such campaigns. All the efforts do not appear to lower the actual illegal fishing pressure on *S. gigas*, and it is necessary to develop a rather harsh campaign to keep *S. gigas* alive for the next generation, which may be more conscious of the importance of endangered species and nature conservation.

KEY WORDS: Queen conch, *Strombus gigas*, education, conservation

Assessing Populations of Queen Conch from the Mexican Caribbean: Maximum Sustainable Yield Levels and Stage-classified Demographic Models

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The queen conch, *Strombus gigas*, is a large marine gastropod that is widely distributed in sea grasses and on sandy bottoms throughout the Caribbean Sea. For centuries it has been one of the most valuable fisheries resources in the region, resulting in heavy stock exploitation. A variety of methods have been used to assess stock status relative to fishing pressure, however there are only a few studies that incorporate conch life-history and fishery parameters to guide the management of the species.

Queen conch vital rates and size/age structure depend on growth rate and body size, and to some extent on sex ratio. Queen conchs grow in shell length only until the onset of sexual maturity; adults do not grow in shell length but in shell lip thickness. Furthermore, individuals of the same age differ considerably in size; thus age and length alone do not provide sufficient information on fecundity or natural mortality, which are important elements used in the design of management strategies. Size increments (in length and lip thickness) from 458 marked and recaptured individuals were used in this study to develop a stage-classified demographic model to project different scenarios of mortality, fecundity and stage-structured (size-age) harvest; and to test the sensitivity of the rate of population increase (R_0) to changes in those parameters.

KEY WORDS: Queen conch, *Strombus gigas*, maximum sustainable yields, demographic models

Evaluacion de las Poblaciones del Caracol Rosado del Caribe Mejicano: Maximos Niveles de Produccion Sostenibles y Modelos demograficos Stage-classified

El caracol rosado, *Strombus gigas*, es un gastrópodo marina grande que se distribuye extensamente en hierbas del mar y en fondos arenosos a través del mar del Caribe. Por siglos ha sido uno de los recursos más valiosos de las industrias pesqueras de la región, dando por resultado la explotación común pesada. Una variedad de métodos se ha utilizado para determinar la presión en relación con de la pesca del estado común, no obstante hay solamente algunos estudios que incorporan parámetros de la vida-historia y de la industria pesquera del conch para dirigir la gerencia de la especie. Las tarifas vitales del conch de la reina y la estructura de size/age dependen de tarifa de crecimiento y de tamaño de cuerpo, y a un cierto grado de cociente del sexo. Los conchs de la reina crecen en longitud de la cáscara solamente hasta el inicio de la madurez sexual; los adultos no crecen en longitud de la cáscara sino en grueso del labio de la cáscara. Además, los individuos de la misma edad diferencian considerablemente de tamaño; así la edad y la longitud solamente no proporcionan la suficiente información en fecundidad o la mortalidad natural, que son elementos importantes usados en el diseño de las estrategias de la gerencia. Los incrementos del tamaño (en grueso de la longitud y del labio) a partir del 458 marcada y de los individuos recobrados fueron utilizados en este estudio para desarrollar un modelo demográfico etapa-clasificado para proyectar diversos panoramas de la mortalidad, de la fecundidad y de la cosecha etapa-estructurada (de la tamaño-edad); y para probar la sensibilidad del índice del aumento de la población (R_0) a los cambios en esos parámetros.

PALABRAS CLAVES: El caracol rosado, *Strombus gigas*, producciones sostenibles máximas, modelos demográficos