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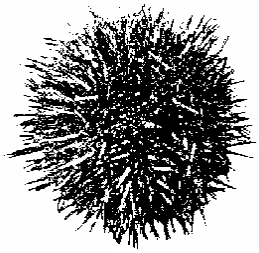
Pacific Region **Stock Status Report 2003/039**



Green Sea Urchin

Map of southern British Columbia showing the core fishing regions (shaded) for green sea urchins

Background

Green sea urchins (Strongylocentrotus droebachiensis) are members of the phylum Echinodermata, which includes sea stars and sea cucumbers. Green urchins occur in the Atlantic and Pacific Oceans. On the Pacific coast of North America they are found from Alaska to northern Washington State, generally in intertidal locations and to depths of more than 140 metres. Green urchins tend to have rather patchy distributions, and appear to be more mobile than the red sea urchin (S. franciscanus), with which they are often found. Green urchins may make seasonal migrations between deep and shallow water depths.

Green sea urchins reach a maximum test (shell) diameter of slightly greater than 100 mm on the Pacific coast. In Alaska they spawn at test diameters of 45-50 mm, and in B.C. the spawning period generally occurs from February to March. The larvae are planktonic for at least two months before settling to the bottom. Green urchin growth rates vary considerably depending on food availability, with rates of 10 mm/year or more recorded from the Strait of Georgia, B.C., and from Alaska. Under food-limited conditions, growth rates as low as 1-2 mm/year have been recorded for green urchins in the northwest Atlantic.

Summary

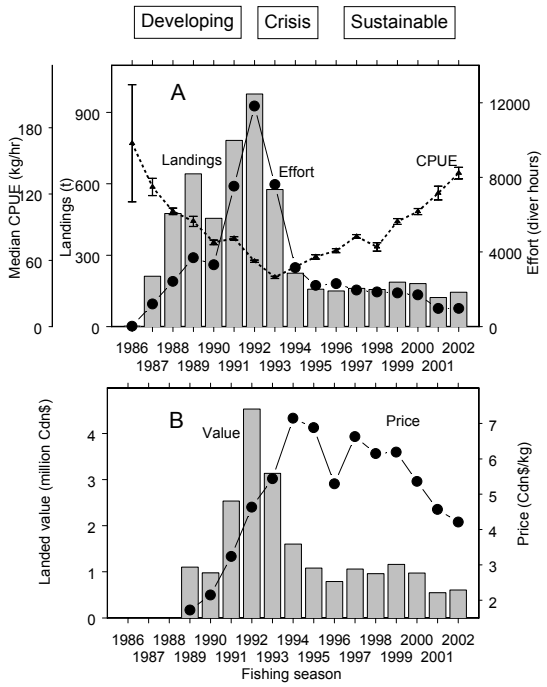
- The green sea urchin fishery is a small (landed value $600,000 in 2002-2003) but important dive fishery in British Columbia.
- The fishery began in 1987. Landings peaked in 1992, and have been capped by a total allowable catch (TAC) near 175 tonnes since 1996.
- The fishery is managed by area quotas, permanent closures, seasonal closures, a minimum size limit, and individual quotas; the only harvest method permitted is hand-picking by divers.
- The fishery is restricted to two main regions in southern B.C. (Queen Charlotte Strait; and Gulf Islands – Victoria).
- Green sea urchin populations have been rebuilding in the Queen Charlotte Strait- Johnstone Strait region; fishery-independent surveys

Canada

conducted annually since 1995 at index locations in this area found the biomass of legal-sized green urchins in 2001 and 2002 were the highest observed.

The Fishery

The fishery for green sea urchins is a roe fishery, with principal markets in Asia. Only hand-picking by divers is permitted. The fishery is generally conducted during winter (November to March) when roe quality and quantity, and market prices, tend to be highest. The factors producing high-quality roe are unclear, and quality can vary significantly within and among areas. The present management system for green sea urchins in the Pacific Region consists of area quotas and closures, a minimum size limit, and individual licence quotas. Although the fishery is relatively small (landed values from October 2002 to March 2003 were $600,000), it is an important component of the echinoderm dive fisheries in B.C. (which include red sea urchins and sea cucumbers).



Annual landings, effort, catch per unit of effort (CPUE), landed value, and unit price of green sea urchins in British Columbia.

Catch

The commercial fishery for green sea urchins in B.C. started in 1987. Sporadic catches occurred throughout the year in the early fishery, but later focused on the winter due to good roe quality and the best market prices. Data compilations and analyses are therefore expressed on a “fishing season” basis, defined as October to March and designated with the year for October (e.g. the October 1997 to March 1998 fishing season is designated 1997). Landings peaked in winter 1992 at 978 tonnes, with a value of $4.5 million. The subsequent decline in landings was in part due to management actions, implemented because of conservation concerns resulting from the explosion of effort and catch and the lack of a detailed resource assessment. Landings since 1995 have averaged

about 157 tonnes. The majority of landings have come from southern B.C. waters because of better roe quality and proximity to processing plants (the product is processed or shipped live).

Fishery Management

A minimum test (shell) diameter of 55 mm was established in 1988 to allow green urchins to spawn at least once, and because of market preferences for larger animals. The number of licences was capped in 1991, and has remained at 49 since 1993. An arbitrary total allowable catch of 449 metric tonnes was established for the south coast in 1994, as a result of conservation concerns. The first formal assessment of green sea urchins in the Pacific Region occurred in 1995. This assessment recommended restricting fishing to the historical core Pacific Fishery Management Areas (all in the south coast), resulting in two principal fishing regions: Queen Charlotte Strait (Management Areas 11-13) and the Gulf Islands-Victoria region (Management Areas 17-20,28; see map). Also in 1995, an Individual Quota system was implemented with validation at designated landing ports. In recent years the total allowable catch has been set at 179 metric tonnes (3.6 metric tonnes per licence) within the identified core fishing areas.

Resource Status

Logbook records of fishing activities are required as a condition of licence. These records are used to calculate the trend in catch per unit of effort by management area. Catch per unit of effort declined from the beginning of the fishery, but has been increasing since 1993. These catch and effort data are used in a surplus production model to estimate the maximum sustainable yield of green sea urchins from the available core fishing areas. In the Queen Charlotte Strait and Johnstone Strait region the maximum sustainable yield was estimated to be 321 $\pm$ 42 tonnes, and for the Gulf Islands-Victoria region 86 $\pm$ 10 tonnes. These were recommended to be limit reference points which management actions should ensure are not exceeded. Target reference points for total allowable catches were suggested in the range of 25 to 50% of the estimated maximum sustainable yield to account for uncertainties in the input data and the assumptions of the surplus production model. A Bayesian version of the surplus production model which incorporates uncertainties in both the input observations (CPUE) and model structure indicated that these reductions from MSY have a low probability (1.4 – 12.7%) of including the actual MSY value, and they are therefore precautionary target reference points.

Two important questions arise from the assessment of green sea urchins in the Pacific Region. First, what is the productivity (recruitment, growth, mortality) of green sea urchins in B.C. waters? Second, how can the abundance of green sea urchins in the core fishing areas, the abundance of legal size (55-mm) urchins, and the proportion of legal-sized urchins which have high-quality roe, be estimated? To examine the latter question, Fisheries and Oceans Canada, the West Coast Green Urchin Association, and local First Nations have embarked on a series of fishery-independent surveys in key fishing locations in Queen Charlotte Strait (Area 12) and the Gulf Islands (Area 18). These surveys are

examining green sea urchin distributions, abundance, and biology, as well as estimating natural and fishing mortalities, exploitation rates, and general growth rates in the surveyed areas to help improve the assessment of green sea urchin resources.

Outlook

The explosive increases in effort and landings of green sea urchins that occurred in the early 1990s are typical of newly developing fisheries, and subsequently were restrained by the late 1990's. Landings have stabilized since 1995 and the annual catch per unit of effort has continued to increase such that the Pacific Fishery Management Plan for green sea urchins now offers quota projections two years in advance. However, the fishery has been reduced to a small but important seasonal component of a suite of echinoderm dive fisheries. A significant factor in the reduced landings in recent years has been very low prices caused by a large volume of product appearing on the market from the Russian Pacific region. There is limited potential for major expansion of this fishery in B.C.

In general, green sea urchin populations in B.C. appear to be rebuilding in response to reduced fishing pressure since 1993. Collaborative multi-agency surveys are key to corroborating estimates of green urchin biomass and impacts of fishing, and identifying natural fluctuations in biological characteristics. Such joint work is crucial for building a sustainable fishery for green sea urchins on Canada's Pacific coast.

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