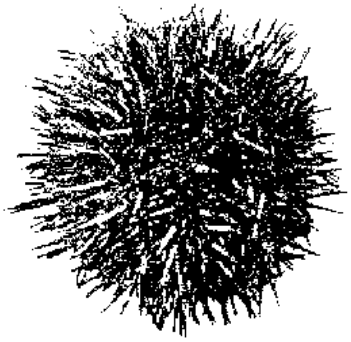

Green Sea Urchin

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 some form of seasonal migration 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.

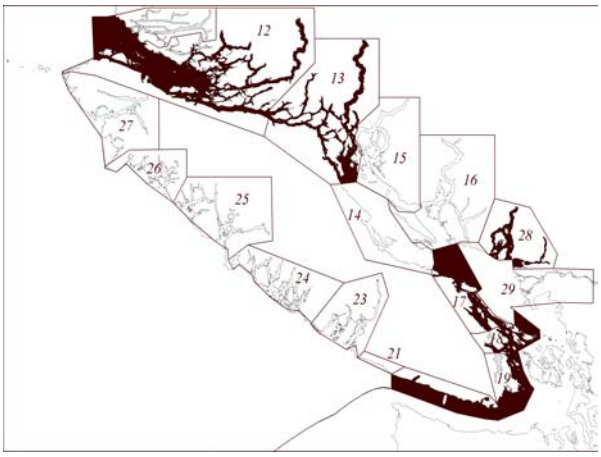

Fig. 1. Map of southern British Columbia showing the Pacific Fisheries Management Areas (numbers) and core fishing regions (shaded) for green sea urchins.

Summary

- The green sea urchin fishery is a small ($1.2 million in 1999-2000) 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 166 tonnes since 1996.
- The fishery is managed by area quotas and 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; in the Gulf Islands-Victoria region, fishery independent surveys are finding good abundances of sub-legal sized green urchins.

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, 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 1999 to March 2000 were $1.2 million), it is an important component of the echinoderm dive fisheries in B.C. (which include red sea urchins and sea cucumbers).

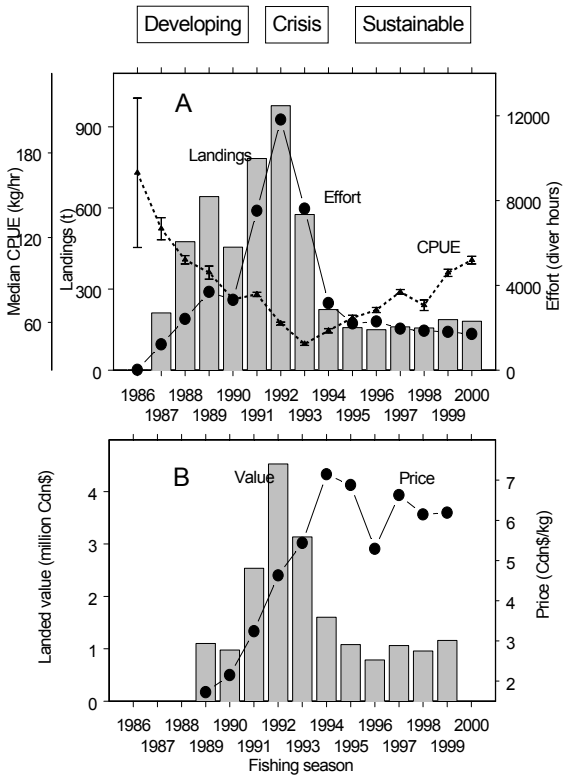

Figure 2: Annual landings, effort, catch per unit of effort (CPUE), landed value, and unit price of green sea urchins in British Columbia.

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 been about 150 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 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 (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 166 metric tonnes (3.4. 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 then 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 (Areas 11-13) the maximum sustainable yield was estimated to be 308 tonnes, and for the Gulf Islands-Victoria region (Areas 17-20, 28) 77 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.

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 validated? 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 appeared to have been 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. There is limited potential for major expansion of this fishery, as the sustainability of green sea urchin populations under fishing pressure in those areas presently closed to fishing, principally the west coast of Vancouver Island and most of the central and northern B.C. coast, remains to be proven.

In general, green sea urchin populations in the Queen Charlotte Strait-Johnstone Strait region appear to be rebuilding and recently there has been a good pulse of recruitment. Green urchin populations in the southern Strait of Georgia also appear to have received good recruitment recently, although further surveys over the next few years will be needed to verify the recovery of these stocks.

The 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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