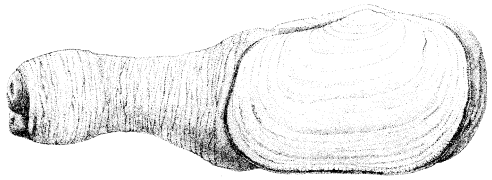


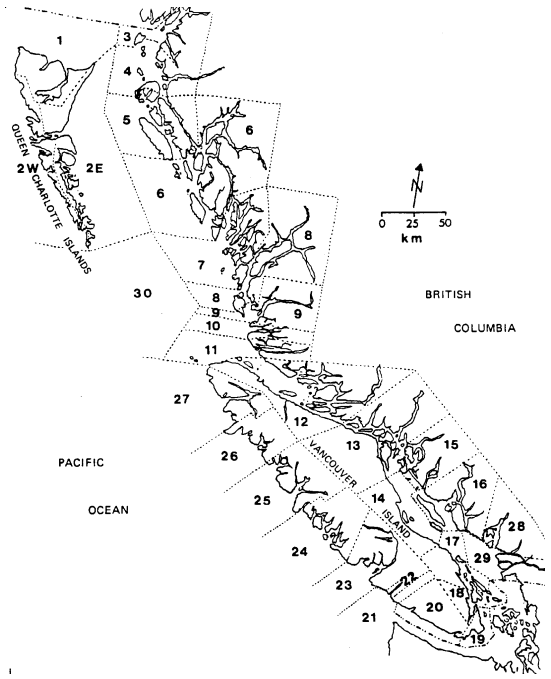
Geoduck Clam

Background

The geoduck clam, Panopea abrupta, occurs from Alaska to the Gulf of California in the northeast Pacific, from the intertidal zone to depths of at least 110 metres. It buries itself up to a metre deep in sand, silt, gravel and other soft substrates. The fishery occurs throughout coastal British Columbia and is conducted with HOOKA dive gear.

Geoducks have separate sexes. Spawning occurs annually, primarily from June to July, when waters are warm. Females release from 7 to 10 million eggs, which develop through several stages in the water column until settling on the bottom within 40 to 50 days. At a shell length of 2 mm, they burrow into the substrate and can bury to a refuge depth of 60 cm in two years. The end of the burrowing stage coincides with the beginning of annual reproductive activity. Mature sex organs are found in clams ranging from 7 to 107 years old, suggesting that individuals may be capable of reproducing for over a century.

Geoducks are among the longest-lived animals in the world. Growth-ring analysis shows many individuals live for more than 100 years. They grow rapidly in the first 10 to 15 years, after which time the growth in shell length almost ceases and is replaced by a thickening of the shell and a slow increase in body weight. Geoducks begin to recruit to the fishery at age 4 and are fully recruited at 12 years.



Pacific Fisheries Management Areas (PFMA) for the coast of B.C.

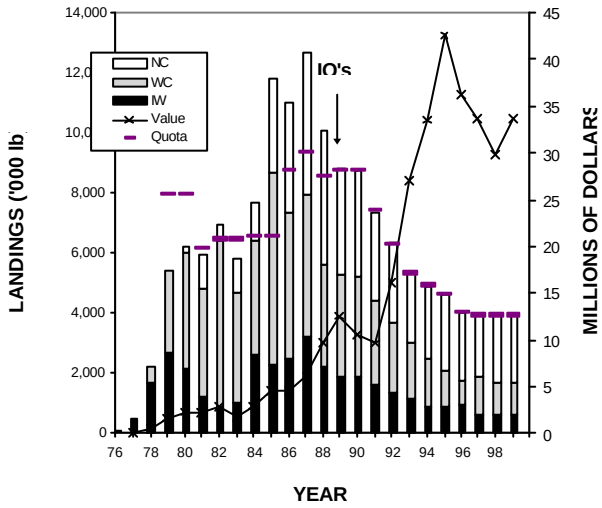
The Fishery

The geoduck fishery continues to be one of B.C.'s most valuable. In 1995, landed value peaked at approximately $42 million (ex-vessel price) but has since declined to about $33 million. The product is sold live to Asian markets and the value of the fishery is largely market-driven. The markets favour geoducks with light-coloured, unblemished necks, however the same price is paid to fishermen regardless of quality. Geoducks are harvested individually by divers with the use of a directed water jet. The fishery is conducted throughout the year, but time-area closures do occur as a result of paralytic shellfish poison (PSP) contamination.

Geoducks have been fished commercially in B.C. since 1976. The fishery began in the inside waters (PFMA 12 to 19, 28, 29), expanded to the west coast of Vancouver Island (PFMA 21 to 27) the following year, and to the north coast (PFMA 1 to 11) in 1980. Landings peaked in 1987 at 5,735 tonnes and steadily declined to 1,817 tonnes (4

million lb) in 1996 through management actions. Since then, quotas and landings have remained at about the same level.

The fishery was initially unregulated and expanded rapidly until 1979, when limited entry and arbitrary catch limits were imposed. Licence limitation reduced the fleet to 55 in 1981. Individual vessel quotas (IVQs) were introduced in 1989, along with a 3-year rotational fishery, in which only one third of the coast is fished in any one year, but at three times the annual rate. With the IVQ, all landings are monitored by port observers. The costs associated with port validation of vessel landings, as well as for on-grounds observer coverage, market sample and biological sample collection and processing, and survey data collection are recovered from the industry.



Annual quotas, value and catch by region of British Columbia. NC=North Coast, WC= west coast of Vancouver Island, IW=inside waters of Van. Is.

Resource Status

Geoduck quotas are based on a constant-catch strategy, where the estimated virgin biomass is fished at a 1% annual exploitation rate, and quotas change only as estimates of virgin biomass are modified. Virgin stock biomass for each geoduck bed is calculated as a product of estimates of the bed area, mean virgin geoduck density, and mean individual geoduck weight. Since 1984, quotas have been based on fisheries and survey data.

Geoduck bed area is measured by digitizing polygons on reference nautical charts, which are drawn to represent the cumulative geo-referenced fishing location information reported by fishermen. The accuracy of these estimates is affected by the accuracy of the data supplied by the industry, the interpretation of this information and the imprecision of the nautical charts used.

Estimates of mean geoduck density were initially based on surveys conducted in Washington state and on industry reports. The earliest transect survey designed to measure density was conducted in B.C. in 1992 and, since that time, standard surveys of geoduck beds are conducted annually throughout the coast. As the results become available, density estimates used to calculate biomass are modified. Bed-specific mean geoduck weight is determined from piece-count and validated weight data from harvest logbooks.

The harvest rate of 1 % per year was derived from yield-per-recruit analysis. Pending the analysis of commercial data and on-going research data, designed to examine stock and recruitment dynamics, the harvest rate is maintained at 1 %.

Individual geoduck beds are grouped by geoduck management areas. Over time, smaller numbers of beds are grouped together and the number of management areas has increased in order to spread out fishing effort and to reduce the potential for local over-harvesting. Based on conservative estimates of area, density and productivity, approximately 10 % of the total coastwide bed area of 26,400 hectares is believed to have been overharvested, and is now closed to allow recovery.

The commercial fleet has explored and discovered most of the productive grounds in the south coast, whereas new beds are still being discovered in the north coast of B.C.

Outlook

Continued improvement in the estimates of geoduck density and total bed area are anticipated through results of surveys and on-grounds observer reports. The steady decline in quotas seen in the last decade ceased and it is expected that quotas for the near future will remain at the levels set for the 1997 fishery.

There are large numbers of geoducks that inhabit natural refugia. These include deep water stocks, as divers are limited to depths of less than 20 metres, colonies in gravel- or shell-packed substrates from which geoducks are too difficult to extract, individuals considered esthetically inferior and unacceptable to the market, and stocks in contaminated areas and parks. These form a protected breeding pool that is exclusive of the fishable population. In addition, the habit of geoducks to retract their necks in response to disturbance serves to protect a portion of the exploitable population.

Experimental work on the effects of fishing on recruitment is in progress. Age compositions from biological samples, and reports from fishermen indicate that there has been strong recruitment in recent years in some geoduck beds. The effect of harvest on geoduck populations requires investigation.

For more information contact:

Claudia Hand
Stock Assessment Division
Pacific Biological Station
Nanaimo, B.C. V9R 5K6
Tel: (250) 756-7139
Fax: (250) 756-7138
E-Mail: handc@pac.dfo-mpo.gc.ca

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PSARC Secretariat
Pacific Biological Station
Nanaimo, BC V9R 5K6
Phone: (250) 756-7208
Fax: (250) 756-7209
E-Mail: psarc@pac.dfo-mpo.gc.ca
Internet Address: (www.dfo-mpo.gc.ca/csas)

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