

Coastal Zone

Species Profile Series

No. 4

Green Sea Urchin



Illustration by Robert Perry

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Other common names of the green sea urchin (*Strongylocentrotus droebachiensis*) include 'urchin' and 'whore's egg'.

Physical Characteristics

- The green sea urchin is spherical and covered with long movable spines. Echinoidea (Class name) means 'like a hedge hog'. Its skeleton, known as the test, may be up to 75 mm in diameter.

Distribution

- Found inshore from the Arctic south to Cape Cod, occurring in deeper water as far south as New Jersey. Maximum depth range is 40 to 60 m.
- Most abundant in exposed rocky bottom, shallow, subtidal communities along the northeastern coast of North America where its grazing activities severely limit the distribution of large algal species. Common throughout Newfoundland.
- Generally most abundant just below the subtidal algal fringe (5 to 10 m depth) with numbers decreasing at greater depths.

Natural History

* Life Cycle

- Spawning occurs in spring/early summer when conditions such as water temperature and food availability (phytoplankton bloom) are favourable for fertilization, and embryonic and larval development. The feeding, free-swimming larvae may remain planktonic for several months. Eventually, the larval stage sinks to the ocean bottom and metamorphoses to the initial post-larval urchin stage in a matter of hours. Size at sexual maturity can be as small as 15 to 20 mm diameter with corresponding ages ranging from 4 to 10 years.

* Habitat Requirements

- Habitat needs vary depending on the life cycle stage. Larval urchins require uncontaminated seawater of suitable temperature and salinity. Food is an important factor for the plankton-eating larvae. Survival of postlarval sea urchins is highest on shallow water, rock substrate with kelp cover. A minimum of moderate wave exposure is necessary for optimal growth and development. Sea urchins are very sensitive to reduced salinity.

* Feeding and Predation

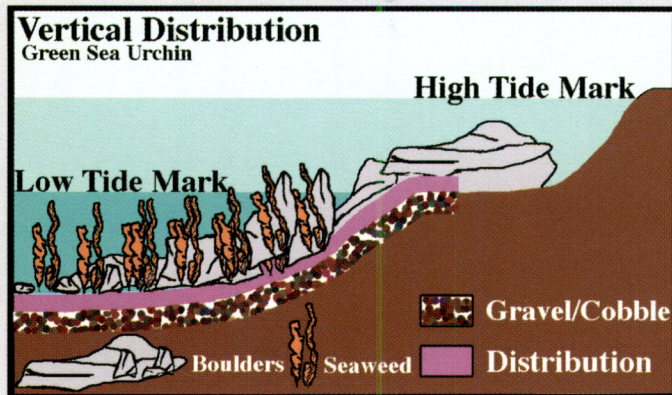
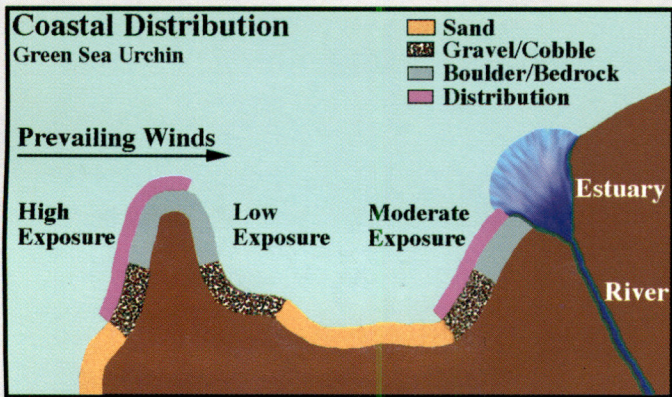
- Sea urchin larvae feed mainly on phytoplankton. After settling to the bottom, the preferred food includes many types of organic material, living or dead. Macrophytes (large algal species, especially kelp) and dead animals are often eaten by the green sea urchin.
- Sea urchin larvae are susceptible to predation by other plankton as well as surface-feeding plankton-eating fish. Primary predators of juvenile and adult sea urchins include American lobster, crabs, and certain fish species. Sea birds can also be predators if urchins are accessible in the intertidal or high subtidal region.

Potential Impacts of Nearshore/Coastal Development

Human impact on sea urchin habitat, and ultimately on the resource itself, varies according to life cycle stage.

* Larvae

- This is the most sensitive stage of the urchin life cycle. Potential negative impacts can be caused by the following:
 - effluent from power plants can alter water temperature and salinity.



- poor agricultural practices can increase siltation and turbidity which may affect larval growth, development, and survival.
- industrial plant effluents containing petroleum products and heavy metals can reduce larval survival and growth. Other possible effects of contaminants on urchin larvae include increased malformation and delayed development.

* Juveniles and Adults

- Less sensitive than the larval stages, juveniles and adults are still susceptible to development impacts, both directly and indirectly through physical habitat change. For example:
 - nearshore dredging can physically alter the substrate and cause excessive siltation which destroys habitat and reduces survival.
 - other sources of siltation can include poor agricultural and forestry practices and wharf and breakwater construction.
 - harvesting of certain kelp species reduces food sources for urchins. Gear associated with such

practices can adversely alter the physical makeup of the substrate.

- discharges such as bleached kraft mill effluent, drilling muds, heavy metals, pesticides, and oil can have lethal and sublethal effects on individuals. The sublethal effects on individuals can reduce recruitment to the populations. Contaminants in individuals not only affect resource marketability, but the added stress makes the animals more susceptible to disease and less tolerant to temperature and salinity change.

Fishery

- Green sea urchins are harvested in certain shallow subtidal areas, usually by SCUBA divers. Timing of their collection is critical because the animal's roe is the target of harvest. The Asian market is quite specific with respect to the stage and quality of the roe. Optimal harvest time varies between locations, depending mainly on water temperature and food availability. Generally, the harvest in Newfoundland is best in late winter or early spring, prior to spawning.
- In recent years, commercial harvesting has occurred mainly in Trinity Bay and Conception Bay, with lesser efforts in Placentia Bay and Fortune Bay. During the period December 1993 to March 1994, just under 20 tons of the resource were harvested from these areas.

Selected References and Further Reading

- Dooley, T. 1994. Developing a commercial sea urchin fishery in Newfoundland. Government of Newfoundland and Labrador, Department of Fisheries, Harvesting Operations Division. 9 p. + App.
- Himmelman, J.H. 1978. Reproductive cycle of the sea urchin, *Strongylocentrotus droebachiensis*. Canadian Journal of Zoology 56: 1828-1836.
- Hooper, R., F. Cuthbert, and D. Patey. 1993. Newfoundland Sea Urchins: Studies on roe quality, yield and maturation in relation to specific habitats around the coasts of Newfoundland. Rep. for the Government of Newfoundland and Labrador, Department of Fisheries, St. John's, Newfoundland. 66 p + App.

For further information, please contact your local office of the Department of Fisheries and Oceans.