

Maine Sea Urchin Research Fund Projects

Commercial Catch Sampling	Researchers Kerry Lyons and Margaret Hunter, Department of Marine Resources	Summary DMR biologists visit one port or buyer in each Zone each week, weather permitting. As many different sites as possible are visited, to cover the state as completely as possible. During each trip, data are collected from harvester and buyer interviews about catch, fishing effort, weather, market price, and roe quality. A sample of urchins from each catch is weighed and measured. Various statistics on catch, fishing effort, and catch per unit effort are calculated. Catch per unit effort (lbs per hour) can be used as an index of stock abundance. Size composition data are used to analyze the impacts of, and compliance with, legal minimum and maximum size limits. Diameter-weight relationships are used to develop stock biomass estimates.
Status Ongoing since 1994. Annual reports available.	Cost from Fund Approx. \$35,000. annually.	
Commercial Landings Data from Logbooks	Researchers Kerry Lyons and Margaret Hunter, DMR	Summary All sea urchin dealers are required to submit logbooks that report the date, harvester, pounds, roe index, and price for every lot of urchins purchased from harvesters. These data are analyzed to calculate total landings by month, season, county, zone, and statewide. Daily prices and catches are computed and are useful in setting future seasons. Harvester data are used to estimate the total effort in the fishery.
Status Ongoing since 1996. Landings data available.	Cost from Fund Approx. \$25,000. annually.	
An Economic Analysis of the Market for Maine Sea Urchins	Researchers Dr. James Wilen, U of CA and Dr. Cathy Wessells, U of RI	Summary The sea urchin market structure and the mechanisms which determine prices were described. Included is an analysis of the complete marketing chain, from harvest to final consumption in Japan. (Maine harvester→buyer→processor →export/ import market→Japanese wholesale market→ Japanese retail→consumer.) The study analyzed the Japanese market for various sea urchin roe products and examined trends in worldwide urchin supply. Primary urchin supplier nations are Chile, Japan, USA, Russia, and Canada. Primary factors influencing roe prices are: country of origin, roe quality, the Japanese economy and average income, price of competing products, customs and traditional holidays, and the yen-dollar exchange rate.
Status Complete, 1997. Report available. 88pp.	Cost from Fund \$34,465.	

<p>Density-related Reproductive Trade-offs in the Green Sea Urchin & Implications to the Maine Fishery</p>	<p>Researchers Richard A. Wahle, Ph.D., Hoyt Peckham, Bigelow Lab, West Boothbay Harbor, Maine</p>	<p>Summary Population surveys were conducted at seven mid-coast Maine sites to determine sea urchin population density, gamete production, and kelp cover at sites representing a natural range of population densities. Field experiments were conducted to determine the influence of body size, urchin density, and kelp canopy on fertilization success of urchins at different levels of aggregation. Results suggested that 1) urchins at high density and in deeper water are food-limited; 2) fertilization rates are density dependent and decline much faster with decreasing density than individual gamete production increases, so depleting sea urchin populations may result in a disproportionate decline in larval production. This also suggests that dense patches of urchins, with low individual roe counts, may contribute significantly to urchin reproduction.</p>
<p>Status Complete, 1998. Report available. 37pp.</p>	<p>Cost from Fund \$50,931.</p>	
<p>Temporal and Spatial Variability in the Relationships Between Adult Size, Maturity and Fecundity in Green Sea Urchins</p>	<p>Researchers Dr. Robert L. Vadas, U of Maine at Orono, and Dr. Brian F. Beal, U of Maine at Machias</p>	<p>Summary This project studied sea urchin growth and reproduction, and found that spawning (which varied by about 8 weeks from west to east) correlated with temperature and phytoplankton pigments. Grade A roe decreased from west to east. Urchins begin contributing to reproduction at about 30-40 mm size, and become sexually mature at about 45mm size (1.77in.) although this ranged from 42-54 mm. This confirmed that the 2-inch (51mm) size limit allowed for some fully mature urchins to reproduce before capture, but there is not a large safety factor in this measure. Urchins took about 5-7 years to reach 2 inches, although this varied greatly with location and habitat. In general, larger urchins produced many more eggs than small urchins, supporting the concept of a maximum size limit. The study also suggested that there may be "runt" populations of small urchins that never reach 2 inches, no matter how old they become.</p>
<p>Status Complete, 1999. Report available. 136pp.</p>	<p>Cost from Fund \$132,938.</p>	
<p>Settlement and Survival of the Green Sea Urchin in Maine: Effects of Algal Habitat</p>	<p>Researchers Douglas C. McNaught and Dr. Robert Steneck, U of ME</p>	<p>Summary The project examined larval settlement and survival at several sites at York, Pemaquid, Mt. Dessert, and Jonesport. Results: 1) The supply and settlement of urchin larvae was lowest in Jonesport and increased to the west; 2) Mt. Dessert and Pemaquid had the most young urchins; 3) Even though the York sites had the highest supply of settling larvae, they had the poorest rates of survival; 4) Kelp and understory algae had a negative effect on survival of newly settled urchins; 5) More micropredators (small crabs) were found in kelp beds; and 6) urchin harvesting, which removes the primary kelp grazer, causes an increase in algal habitat which may directly inhibit the survival of newly settling urchins, suggesting that overharvested areas may not recover quickly.</p>
<p>Status Complete, 1999. Report available 59pp.</p>	<p>Cost from Fund \$169,534.</p>	

<p>An <i>In Situ</i> Study of the Impact of Sea Urchin Dragging on the Benthos</p>	<p>Researcher Dr. Richard A. Wahle, Bigelow Lab, Boothbay Harbor</p>	<p>Summary The study documented the short-term impacts of dragging on the seabed by different urchin dragging gear on different substrates. It was conducted during the 1997-98 season. Local urchin dragger fishermen participated. A light, "pipe" drag was used in Zone 1 to compare impacts on cobble with ledge. In Zone 2, the effects of a pipe drag, a heavier scallop drag, and a typical urchin drag were compared on a cobble bottom.</p>
<p>Status Complete, 1999. Report available. 22pp.</p>	<p>Cost from Fund \$91,353.</p>	<p>The scallop drag collected more rocks and caused significantly more damage to urchins and habitat than the other two drags. Drag efficiency was reduced at the cobble sites, where crevices offered some refuge for urchins, as compared with ledge.</p>
<p>Sea Urchin Drag Study</p>	<p>Researchers Edwin P. Creaser, Wayne Weeks, DMR, West Boothbay Harbor</p>	<p>Summary The first part of the study evaluated data from urchin samples collected from the commercial catch by port samplers during the 96-97 and 97-98 seasons. About 25% of the urchins caught in scallop drags were visibly damaged, 15% of those caught by other drags were damaged, and about 1% of those caught by divers were damaged. In the second part of the study, sea samplers rode aboard commercial urchin draggers (66 trips) and recorded information on factors that might influence damage, such as drag type, weight, chain window size, towing speed and duration, wind speed and direction, tidal stage, bottom type, and sea state. In fact, there were so many variables that it was difficult to identify trends. Heavy scallop drags produced the most heavily damaged urchins, "pipe" and "Runtz" style drags the least. Lobsters were encountered in approximately 1 of every 3 to 8 tows, and were usually small and undamaged.</p>
<p>Status Complete, 1998. Report available. 29pp.</p>	<p>Cost from Fund \$41,666.</p>	
<p>Sea Urchin No-Fish Areas in Maine: Rates of Recovery, Gonad Indices, and Algal Habitats, in Fished and Unfished Areas</p>	<p>Researchers John Vavrinec, Susanne Meidel Ph.D., Richard Wahle, Ph.D., Robert Steneck, Ph.D., U Maine</p>	<p>Summary In 1999, six small areas (2 at York and Jonesport, 1 each at Pemaquid and Schoodic) were closed to urchin fishing. This study has been tracking their recovery rates, algal abundances, urchin roe indices, size, abundance, and growth rates, compared with nearby fished areas. The study has also monitored larval settlement, continuing the time series begun by McNaught and Steneck above. Larval settlement in 2000 and 2001 increased from a low in 1999. Urchins reach legal size in 4-6 years in appropriate habitat. Three sites with established algal beds have not shown any sign of urchin recovery. Two sites have shown some recovery, the sixth has been poached. Algal cover at all the sites, as well as sites in the Mt. Desert area, except for Jonesport, is increasing. This shift from urchin barren to algal bed is moving along the coast from west to east, and is no longer just a Zone 1 problem. Closing an area may be beneficial only if it is done <u>before</u> urchins are so depleted that the area becomes an algal bed.</p>
<p>Status Complete, 2003. Reports available.</p>	<p>Cost from Fund \$179,018. for 1999-2001, \$142,081. for 2002-2003.</p>	

<p>Reseeding the Green Sea Urchin in Depleted Habitats</p>	<p>Researchers Amanda Leland, Robert Steneck, Ph.D., U Maine Darling Center</p>	<p>Summary Since newly settling urchins may not survive well in algal beds, it is possible that over-harvested areas will not recover quickly without some help. In August 2000, a depleted area at Cape Elizabeth was reseeded with sub-legal sized urchins harvested nearby. The urchins were promptly eaten by crabs (<i>Cancer</i> sp.) and none survived. The experiment was repeated using larger urchins the following April, when temperatures are more favorable for urchins and crab activity is low. The urchins survived well at their new site for about four months, but again were eaten by crabs in August.</p>
<p>Status Complete, 2002. Report avail. 25pp.</p>	<p>Cost from Fund \$95,205 for 2000, \$71,809 for 2001.</p>	
<p>Cobscook Bay Sea Urchin Relocation</p>	<p>Researchers Robert Russell, DMR, Cobscook Bay Fish. Asso.</p>	<p>Summary In March 2001, about 200 totes of poor quality urchins were dragged from a deep water site in Cobscook Bay and moved to two nearby shallower, depleted areas with good food supplies. At one site there was 74% mortality within a few weeks. The other site was disturbed by a dragger and possibly a barge, but had at least 53% mortality. Roe content for the surviving moved urchins increased to 18% in September 2001, compared with 3% at the deep source site.</p>
<p>Status Complete, 2001. Report avail. 16pp.</p>	<p>Cost from Fund \$5,000.</p>	
<p>Maine Assessment Survey for Green Sea Urchins</p>	<p>Researchers Robert Russell, Margaret Hunter, DMR, Dr. Yong Chen, Robert Grabowski, Kate Jones, U Maine</p>	<p>Summary A stock assessment is likely to be biased if data derived only from the fishery are used. A fishery-independent survey can 1) provide unbiased urchin abundance data for formal assessments, 2) establish a baseline of urchin abundance data against which future survey results can be compared, 3) detect changes caused by die-offs, and 4) quantify new urchins coming along. During the summer of 2001, a DMR/SUZC/UMaine/urchin industry cooperative survey was completed, evaluating urchin abundances, sizes, and algal cover at 292 sites from Kittery to Eastport, using urchin industry vessels and divers. The DMR continues to conduct a similar survey every year.</p>
<p>Status Ongoing. Annual reports available.</p>	<p>Cost from Fund About \$35,000 annually.</p>	

Developing, Evaluating, and Refining a Stock Assessment Framework for the Maine Sea Urchin	Researchers Yong Chen, Ph.D., U Maine, Orono, Margaret Hunter, DMR, W. Boothbay Harbor	Summary The project will evaluate and improve a computer model and its framework that has been developed and used to simulate the Maine sea urchin fishery and stock. The model incorporates data from several of the projects above to calculate estimates of stock biomass, fishing mortality rates, and other population parameters. It can be used to evaluate different management options, and has the ability to predict whether stocks will go up or down in the future, depending on the level of catch.
Status Complete. 2003. Report available, 113 pp.	Cost from Fund \$39,038.	
Testing Two Large-Mesh Sea Urchin Diver Catch Bags	Researchers Margaret Hunter, DMR, West Boothbay Harbor	Summary Two diver catch bags with mesh sizes of approximately 1½-inch and 2-inches square were tested to see whether they retained, or allowed the escape of small sea urchins, when used by divers who “bailed”. Between 8% and 26% of the small, sub-legal sized urchins that were put in the bags fell out through the meshes. Between 0% and 5% of the legal-sized urchins also fell out of the 2” mesh bag, none from the 1½”. The urchins used in the tests were long-spined. Escapement would probably have been greater if they had been short-spined. Use of large mesh is recommended.
Status Complete, 2002. Report avail. 31pp.	Cost from Fund \$1,045.	
Sea Urchin Harvester Surveys Zone 1: Dec 2002, Zone 2: Feb 2003	Researchers Margaret Hunter, Kerry Lyons, DMR, West Boothbay Harbor	Summary Two mail surveys, or opinion polls, were conducted, one to Zone 1 harvesters in Nov-Dec. 2002, and one to Zone 2 harvesters in Jan-Feb 2003. Zone 1 harvesters were asked whether they favored an emergency closure of the fishery (51 no, 38 yes), and how long the season should be next year (60 days was median response). Zone 2 harvesters were asked whether they favored cutbacks for next season (78 yes, 76 no), whether they thought there were more, the same, or fewer urchins in their favorite fishing grounds from, say, two years ago (14 more, 47 same, 89 fewer), and how long the season should be next year (89 days was median response). There were also many comments and recommendations for other types of conservation.
Status Complete. 2003. Reports available for each zone, 15, 26pp.	Cost from Fund About \$900.	

For copies of any of the reports, please contact the DMR Fishermen’s Library, PO Box 8, West Boothbay Harbor, ME 04575, Telephone: (207) 633-9551, E-mail: library@bigelow.org. Some of the reports are available online at <http://www.maine.gov/dmr/rm/seaurchin/research.htm> .