



Sea Urchins

Green Sea Urchin

Strongylocentrotus droebachiensis

Priority 2 Species of Greatest Conservation Need (SGCN)

Class: Sea Urchins (*Echinoidea*)

Order: Sea Urchins (*Camarodonta*)

Family: Sea Urchins (*Strongylocentrotidae*)



General comments:

Green Sea Urchin (*Strongylocentrotus droebachiensis*) supports an active commercial fishery in Maine. Maine DMR dive survey biomass indices show an overall decline in Green Sea Urchin abundance since 2001, although some areas still harbor stable populations.

No Species Conservation Range Maps Available

SGCN Priority Ranking - Designation Criteria:

Recent Significant Declines:	Green Sea Urchin is currently undergoing steep population declines, which has already led to, or if unchecked is likely to lead to, local extinction and/or range contraction. Notes: recent decline: Chen and Hunter, 2003: http://www.sciencedirect.com/science/article/pii/S0165783602000826 Steneck et al
High Climate Change Vulnerability:	Vulnerability: 3, Confidence: , Reviewers:

Habitat Associations:

Formation: Intertidal

Macrogroup: Intertidal Bedrock

* Primary Habitat	Habitat System: Low-Intertidal <i>spawning, adult feeding habitat, juvenile feeding habitat</i>
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Macrogroup: Intertidal Gravel Shore

* Primary Habitat	Habitat System: Lower Intertidal <i>spawning, adult feeding habitat, juvenile feeding habitat</i>
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Formation: Subtidal

Macrogroup: Subtidal Bedrock Bottom

* Primary Habitat	Habitat System: Bedrock <i>over-wintering habitat, spawning, adult feeding habitat, juvenile feeding habitat</i>
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* Primary Habitat	Habitat System: Erect Epifauna <i>spawning, juvenile and adult feeding, over-wintering</i>
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Formation: Subtidal

★ Primary Habitat	Habitat System: Kelp Bed <i>over-wintering habitat, spawning, adult feeding habitat, juvenile feeding habitat</i>
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Macrogroup: Subtidal Coarse Gravel Bottom

★ Primary Habitat	Habitat System: Coarse Gravel <i>over-wintering habitat, spawning, adult feeding habitat, juvenile feeding habitat</i>
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★ Primary Habitat	Habitat System: Erect Epifauna <i>spawning, juvenile and adult feeding, over-wintering</i>
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★ Primary Habitat	Habitat System: Kelp Bed <i>over-wintering habitat, spawning, adult feeding habitat, juvenile feeding habitat</i>
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Macrogroup: Subtidal Pelagic (Water Column)

Habitat System: Nearshore
larval development and dispersal

Habitat System: Offshore
larval development and dispersal

Threats

Threat Priority Level based on Severity and Actionability		Moderate Severity		High Severity	
	Highly Actionable		Medium-High		High
	Moderately Actionable		Medium		Medium-High
	Actionable with Difficulty		Low		Low

IUCN Level 1 Threat Biological Resource Use

IUCN Level 2 Threat: Fishing and Harvesting of Aquatic Resources

Severity: High Severity **Actionability:** Moderately Actionable

Notes: Maine's sea urchin stock has been significantly over-fished. The threat of over-fishing is highly certain and highly likely (occurred in recent years). However, reductions in fishing pressure have only been effective in stabilizing or recovering the stock in some regions. Other regions are showing no signs of recovery despite no fishing in more than 10 years. Other actions, such as reseedling, hold promise but will be difficult to implement.

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IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Agricultural and Forestry Effluents

Severity: High Severity	Actionability: Moderately Actionable
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Notes: Echinoderm larvae are exceptionally sensitive to excessive nutrients, toxic chemicals (including pesticides and chemical therapeutants), and/or sediments. Adults are sensitive, but comparatively to larvae, less effected.

IUCN Level 2 Threat: Domestic and Urban Waste Water

Severity: High Severity	Actionability: Moderately Actionable
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Notes: Echinoderm larvae are exceptionally sensitive to excessive nutrients, toxic chemicals (including pesticides and chemical therapeutants), and/or sediments. Adults are sensitive, but comparatively to larvae, less effected.

IUCN Level 2 Threat: Industrial and Military Effluents

Severity: High Severity	Actionability: Moderately Actionable
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Notes: Oil spills are toxic to species with intertidal distributions. Local scale spills have an unpredictable likelihood and actionability is moderate and influenced by response time to spills.

IUCN Level 1 Threat Climate Change and Severe Weather

IUCN Level 2 Threat: Changes in Temperature Regimes

Severity: Moderate Severity	Actionability: Actionable with Difficulty
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Notes: Increased water temperatures have interactive effects with ocean pH decreasing survivorship of larvae and growth rate of echinoderms. Likelihood is high (high certainty) and large scale. The ability to mitigate sea temperature change is low.

IUCN Level 2 Threat: Habitat Shifting or Alteration

Severity: Moderate Severity	Actionability: Actionable with Difficulty
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Notes: The impacts of increasing ocean acidification on sea urchins is poorly understood (low certainty), but the effects of the threat are likely to occur, statewide (pervasively), given that sea urchins have a calcareous shell and spines and larvae have a calcareous skeleton.

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IUCN Level 1 Threat Invasive and Other Problematic Species, Genes and Diseases

IUCN Level 2 Threat: Invasive Non-native-Alien Species-Diseases

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: Invasive algae (*Codium fragile*) and tunicates (*Didemnum* sp) have colonized sea urchin habitat in some regions. This threat is poorly understood (low certainty), but the threat and its effects are likely to occur in some areas (patchy spatially).

IUCN Level 2 Threat: Problematic Native Species-Diseases

Severity: Moderate Severity

Actionability: Actionable with Difficulty

Notes: It is possible (low certainty) that increasing temperatures in the Gulf of Maine will result in increasing incidence of disease, such as parasitic *Paramoeba* infestations that have plagued Nova Scotia, where water temperatures are generally warmer than the Gulf of Maine.

Species Level Conservation Actions:

Only species specific conservation actions that address high (red) or medium-high (orange) priority threats are summarized here.

Conservation Action	Category	Biological Priority	Type
Monitor stock status through surveys and sampling programs	Survey and Monitoring	critical	on-going

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Conduct research to support stock assessment and population dynamics modeling	Research	high	on-going

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Determine the relative roles of natural predation, fishing mortality, and climate change in stock dynamics	Research	high	new

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Design and encourage the use of more size-selective fishing gear	Public Outreach	high	on-going

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

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Conservation Action	Category	Biological Priority	Type
Support community engagement in developing a fisheries management plan	Species Management	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Assess the feasibility and advantages of local or area species management approaches	Research	high	new

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Determine the feasibility of reseeding programs	Research	moderate	new

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Actions Associated with the Echinoderms Guild:

Conservation Action	Category	Biological Priority	Type
Expand existing education and research among researchers and managers to improve understanding and management ability	Research	high	on-going

Threat(s) Addressed By This Conservation Action

- Domestic and Urban Waste Water

Conservation Action	Category	Biological Priority	Type
Through education and collaboration, reduce the use of antifouling agents and biocides that negatively affect SGCN, and investigate alternative biofouling agents.	Policy	critical	on-going

Threat(s) Addressed By This Conservation Action

- Marine and Freshwater Aquaculture

Conservation Action	Category	Biological Priority	Type
Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance	Public Outreach	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

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Conservation Action	Category	Biological Priority	Type
Investigate the effect of various harvesting practices on the integrity of habitats and trophic and ecological systems	Research	high	new

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Ground-truth mapped habitat and compare to historical maps to monitor change over time, may require updating mapping plans to map more frequently	Survey and Monitoring	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Conduct research to support management, including but not limited to stock assessments, population genetics, population monitoring, etc.	Research	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Encourage the use of more targeted fishing gear in order to reduce bycatch and habitat disturbance	Public Outreach	high	on-going

Threat(s) Addressed By This Conservation Action

- Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Research to understand how effects such as habitat modifications, population changes, and pollution can influence SGCN	Research	high	new

Threat(s) Addressed By This Conservation Action

- Habitat Shifting or Alteration

Conservation Action	Category	Biological Priority	Type
Identify species that are resilient to ocean acidification (OA) and rises in sea surface temperature (SST).	Research	high	new

Threat(s) Addressed By This Conservation Action

- Habitat Shifting or Alteration

Broad Taxonomic Group Conservation Actions:

Additional relevant conservation actions for this species are assigned within broader taxonomic groups in Maine's Wildlife Action Plan: Element 4.

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Habitat Based Conservation Actions:

Additional conservation actions that may benefit habitat(s) associated with this species can be found in Maine's Wildlife Action Plan: Element 4. Click on the Habitat Grouping of interest to launch a habitat based report summarizing relevant conservation actions and associated SGCN.

The Wildlife Action Plan was developed through a lengthy participatory process with state agencies, targeted conservation partners, and the general public. The Plan is non-regulatory. The species, threats, and voluntary conservation actions identified in the Plan complement, but do not replace, existing work