



Sea Stars

Purple Sunstar

Solaster endeca

Priority 2 Species of Greatest Conservation Need (SGCN)

Class: Sea Stars (*Asteroidea*)

Order: (*Valvatida*)

Family: (*Solasteridae*)

General comments:

The Purple Sunstar (*Solaster endeca*) is a cold-water sea star found on rocky bottoms and coarse sediments in the North Atlantic. It has seven to nine arms and feeds primarily on other echinoderms, especially brittle stars and sea stars. Although still present in the Gulf of Maine, it is sensitive to environmental changes and may be impacted by shifts in prey abundance and water temperature.

No Species Conservation Range Maps Available

SGCN Priority Ranking - Designation Criteria:

Recent Significant Declines:	Purple Sunstar 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 - Cobscook Bay; climate change - Appelhans et al., 2012; Keppel et al., 2014; understudied as by-catch, Professional judgement
High Climate Change Vulnerability:	Vulnerability: 3, Confidence: , Reviewers:

Habitat Associations:

Formation: Subtidal

Macrogroup: Subtidal Coarse Gravel Bottom

★ Primary Habitat	Habitat System: Coarse Gravel <i>spawning, assumed juvenile feeding habitat, adult feeding habitat</i>
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Macrogroup: Subtidal Mud Bottom

★ Primary Habitat	Habitat System: Unvegetated <i>spawning, assumed juvenile feeding habitat, adult feeding habitat, assumed over-wintering habitat</i>
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Macrogroup: Subtidal Pelagic (Water Column)

	Habitat System: Nearshore <i>larval development and dispersal</i>
	Habitat System: Offshore <i>larval development and dispersal</i>

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Formation: Subtidal

Macrogroup: Subtidal Sand Bottom

★ Primary Habitat

Habitat System: Unvegetated*spawning, assumed juvenile feeding habitat, adult feeding habitat, assumed over-wintering habitat*

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 Other Options

IUCN Level 2 Threat: Lack of knowledge

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

Notes: There is a lack of knowledge about and monitoring of the population(s) of this species in the region. The lack of knowledge about this species is potentially a severe threat as no action can be taken if threats and populations changes are not known or understood. Monitoring efforts could be carried out with appropriate resources, so threat is moderately actionable.

IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Agricultural and Forestry Effluents

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

Notes: Echinoderm larvae are exceptionally sensitive to excessive nutrients, toxic chemicals (including heavy metals, and pesticides), and/or sediments originating from agriculture and the aquaculture activity. Adults are sensitive, but less so. Likelihood is high and increasing (high certainty). Current spatial extent is most severe in Southern Maine, but expanding along coast along with development of the aquaculture industry, so actionability is moderate, i.e. the threat can be minimized in newly developing areas expanding into the geospatial range of this species.

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IUCN Level 1 Threat Pollution

IUCN Level 2 Threat: Domestic and Urban Waste Water

Severity: High Severity

Actionability: Moderately Actionable

Notes: Echinoderm larvae are exceptionally sensitive to excessive nutrients, toxic chemicals (including heavy metals and pesticides), and/or sediments originating from water-borne sewerage and non-point run-off from housing and urban areas. Likelihood is high and increasing (high certainty), current spatial extent is most severe in Southern Maine, but expanding along coast, so actionability is moderate, i.e. the threat can be minimized in newly developing areas expanding into the geospatial range of this species.

IUCN Level 1 Threat Biological Resource Use

IUCN Level 2 Threat: Fishing and Harvesting of Aquatic Resources

Severity: Moderate Severity

Actionability: Moderately Actionable

Notes: Large-scale, unintentional by-catch in commercial bottom trawl fisheries reduces the population of this predatory species. Population declines may result in decreased benthic diversity through trophic cascades, reducing the availability of food for other species. The likelihood of the threat posed by fishing is high (high certainty) and large-scale (throughout the region), so actionability is low, but moderate in new areas for developing bottom trawl fisheries.

IUCN Level 1 Threat Climate Change and Severe Weather

IUCN Level 2 Threat: Changes in Temperature Regimes

Severity: High Severity

Actionability: Actionable with Difficulty

Notes: Purple sunstars are cold-water species. Increased water temperatures have interactive effects with ocean pH decreasing survivorship of larvae and growth rate of sea stars. Likelihood is high (high certainty) and large scale. Increased water temperatures are linked with lethal disease. Likelihood is unpredictable based on disease agent and thus can range from small to large-scale. The ability to mitigate sea temperature change is low.

IUCN Level 2 Threat: Habitat Shifting or Alteration

Severity: High Severity

Actionability: Actionable with Difficulty

Notes: Ocean acidification results in decreased survivorship of larvae, and growth and feeding by adult sea stars. Likelihood is high and large scale. The ability to mitigate ocean acidification is low.

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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: Invasives such as encrusting colonial tunicates (*Didemnum vexillum*) could decrease the availability of sea star prey, habitat and have other effects largely unknown at this time. Likelihood is high and large scale (throughout the region), so actionability is low.

IUCN Level 2 Threat: Problematic Species-Diseases of Unknown Origin

Severity: High Severity**Actionability:** Actionable with Difficulty

Notes: Vulnerable to Sea Star Wasting Disease (SSWD), a lethal pathogen of unknown origin, that has impacted sea star populations in the Gulf of Maine and other regions. Likelihood is high and large scale (through out the region), so actionability is low.

Species Level Conservation Actions:

None. Only species specific conservation actions that address high (red) or medium-high (orange) priority threats are summarized here.

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