



Sea Cucumbers

Orange-footed Sea Cucumber

Cucumaria frondosa

Priority 2 Species of Greatest Conservation Need (SGCN)

Class: Sea Cucumbers (*Holothuroidea*)

Order: Sea Cucumbers (*Dendrochirotida*)

Family: Sea Cucumbers (*Cucumariidae*)



General comments:

Orange-footed Sea Cucumber (*Cucumaria frondosa*) is the largest and most abundant sea cucumber in the Gulf of Maine. It inhabits rocky and cobble bottoms from the low intertidal zone to depths over 300 m. This species is harvested in Maine under regulated management due to its commercial value and ecological importance as a filter feeder

No Species Conservation Range Maps Available

SGCN Priority Ranking - Designation Criteria:

Recent Significant Declines:	Orange-footed Sea Cucumber 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 Notes: recent decline: ME DMR unpublished data from annual dive survey, 2010-13 http://www.maine.gov/dmr/cukes/chen2007.pdf clim
High Climate Change Vulnerability:	Vulnerability: 3, Confidence: , Reviewers:

Habitat Associations:

Formation: Intertidal

Macrogroup: Intertidal Gravel Shore

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

Macrogroup: Subtidal Bedrock Bottom

* Primary Habitat	Habitat System: Bedrock <i>primary for adult and juvenile, spawning, juvenile and adult feeding habitat, assumed over-wintering habitat</i>
	Habitat System: Kelp Bed <i>juvenile, adult</i>

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Formation: Subtidal

Macrogroup: Subtidal Coarse Gravel Bottom

★ Primary Habitat	Habitat System: Coarse Gravel <i>spawning, assumed juvenile feeding habitat, adult feeding habitat, and over-wintering habitat</i>
★ Primary Habitat	Habitat System: Erect Epifauna <i>spawning, assumed juvenile feeding habitat, adult feeding habitat, and over-wintering habitat</i>

Macrogroup: Subtidal Pelagic (Water Column)

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

Macrogroup: Subtidal Sand Bottom

★ Primary Habitat	Habitat System: Unvegetated <i>spawning, assumed juvenile feeding habitat, adult feeding habitat</i>
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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: Moderate Severity **Actionability:** Highly Actionable

Notes: Maine's sea cucumber stock has probably been over-fished, but lacks a formal assessment. The threat of over-fishing is moderately certain, moderately likely, and probably spatially patchy. However, significant reductions in fishing pressure have occurred recently (2013, 2014). More information is needed to understand the relationships between fishing and stock abundance.

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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 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

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

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: High Severity

Actionability: Actionable with Difficulty

Notes: Orange-footed sea cucumbers are cold-water species. 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

Notes: The impacts of increasing ocean acidification on sea cucumbers is poorly understood (low certainty), but the effects of the threat are likely to occur, statewide (pervasively), given that sea cucumbers have calcified body structures.

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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 availability of habitat and have other effects largely unknown at this time. Likelihood is high and large scale (throughout the region), so actionability is low.

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	high	new

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 stock assessments, e.g. development of predation, reproduction, growth and aging data and habitat mapping	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

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

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

Conservation Action	Category	Biological Priority	Type
Support community engagement in developing a fisheries management plan	Species Management	moderate	new

Threat(s) Addressed By This Conservation Action

 Fishing and Harvesting of Aquatic Resources

Conservation Actions Associated with the Echinoderms Guild:

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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

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

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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.

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