

Seafood Watch
Seafood Report



MONTEREY BAY AQUARIUM*

Crabs
Volume VI

Jonah Crab
Cancer borealis



Image courtesy DFO Canada

Northeast Region

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About Seafood Watch® and the Seafood Reports

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from the Internet (seafoodwatch.org) or obtained from the Seafood Watch® program by emailing seafoodwatch@mbayaq.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices", "Good Alternatives" or "Avoid". The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Fisheries Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling (831) 647-6873 or emailing seafoodwatch@mbayaq.org.

Disclaimer

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Executive Summary

Jonah crab (*Cancer borealis*) is native to the North Atlantic coast of North America. Closely resembling Dungeness crab, Jonah crab supports a small but growing fishery in New England and maritime Canada. Most of Canada's catch is exported to the United States. Stock assessments have not yet been performed for Jonah crab, but both Canadian and U.S. management authorities are watching this developing fishery closely. Since 1998, Canada has had management plans in place for its Jonah crab fisheries, which are managed as a mixed fishery with red rock crab (*Cancer irroratus*). The U.S. has no coordinated interstate management plan for Jonah crab, but the various fishing states regulate the fishery under state law. There is no major concern with finfish bycatch in the Jonah crab fishery, which is primarily a trap fishery, although all New England trap fisheries have been scrutinized for possible interactions with endangered marine mammals, including the critically endangered northern right whale.

Table of Sustainability Ranks

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability		√		
Status of Stocks		√		
Nature of Bycatch			√	
Habitat Effects		√		
Management Effectiveness		√		

About the Overall Seafood Recommendation:

- A seafood product is ranked “**Avoid**” if two or more criteria are of High Conservation Concern (red) OR if one or more criteria are of Critical Conservation Concern (black) in the table above.
- A seafood product is ranked “**Good Alternative**” if the five criteria “average” to yellow (Moderate Conservation Concern) OR if the “Status of Stocks” and “Management Effectiveness” criteria are both of Moderate Conservation Concern.
- A seafood product is ranked “**Best Choice**” if three or more criteria are of Low Conservation Concern (green) and the remaining criteria are not of High or Critical Conservation Concern.

Overall Seafood Recommendation:

Jonah crab:

Best Choice 

Good Alternative 

Avoid 

Series on Crabs

This is Volume VI in a series of seafood reports covering the crabs most frequently found in United States markets and restaurants.

Volume Index:

- I Blue Crab (*Callinectes sapidus*)
- II Dungeness Crab (*Cancer magister*)
- III Stone Crab (*Menippe mercenaria*; *M. adina*)
- IV King Crabs (*Paralithodes camtschaticus*; *P. platypus*;
Lithodes aequispinus; *L. couesi*)
- V Snow Crabs (*Chionoecetes spp.*)
- VI Jonah Crab (*Cancer borealis*)

General Crab Biology

Crabs belong to the order Decapoda, a crustacean order which also includes lobsters, shrimps, and hermit crabs. All decapods possess a full carapace, or head shield, and five pairs of walking legs (Watanabe 2001). Their first three pairs of thoracic appendages are modified into maxillipeds, or feeding legs (Watanabe 2001). In crabs and lobsters, the very first pair of these feeding appendages are sizeable claws that serve for defense and for grasping and manipulating food (Watanabe 2001).

There are more than 4,500 living species of crabs worldwide (Abbott 1980). Many are tiny, or inhabit niches unsuited to mass harvest (Abbott 1980). The "true" crabs, a group which includes the market species discussed in the crabs seafood reports, are distinguished from other decapods by having a greatly shortened abdomen—the part known as the "tail" in lobsters and hermit crabs. In the true crabs, the abdominal segments are greatly shortened and tucked under the carapace. This characteristic earns the true crabs their sub-order name of Brachyura, or "short-tailed" crabs (Abbott 1980).

As arthropods, all crabs have a chitinous exoskeleton, which must be shed repeatedly as the animal grows. The hormonal control of shell-shedding is one of the most intricate physiological processes known to marine science (Abbott 1980). Among the true crabs, females can mate only immediately after they have shed their old shell, while their new exoskeleton is still soft [2].

The sexes are separate in crabs. After mating, females store sperm until conditions are right for egg-laying. The female retains the fertilized eggs on her abdomen for weeks or months until they hatch (Abbott 1980). Females bearing fertilized eggs are called "sponge crabs".

Introduction

Jonah crab is native to the northern Atlantic coast of North America (Nature Conservancy 2002). In the Gulf of Maine, Jonah crabs coexist with American lobsters (*Homarus americanus*) and red rock crabs (*Cancer irroatus*) in shallow, rocky subtidal habitat (Moody and Steneck 1993). Further north, in Nova Scotian waters, they are found only in deeper water (ACMSI 2002). It is speculated that they get their common name from the fact that they were occasionally released alive from the stomachs of whales (Henson, pers. comm.).

It is interesting to note that Jonah crab has a place in neuroscience; its large stomach nerves make it a convenient research animal for studies on neurotransmitters and of how nerves control rhythmic body movements (Montgomery and Ruckert 1998).

Availability of Science

United States Jonah crab stocks have never been assessed, due to the absence of fishery-independent stock data. Canada's Department of Fisheries and Oceans (DFO) has performed a preliminary stock assessment on Scotian Shelf Jonah crab populations (DFO 2000). Biological reference points, such as maximum sustainable yield (MSY), mortality, and fecundity, have not been defined for any Jonah crab fishery; in most cases, catch data are the only indirect indicator of abundance. Canada's DFO requires fishermen participating in the exploratory Jonah crab fishery to report catch, size, and abundance data to management authorities (DFO 2000; DFO 1998a; DFO 1998b).

Market Information

Common and market names:

Jonah crab is also known as Atlantic Dungeness crab.

Seasonal availability:

Jonah crab is available year-round. In Canada's Southwest Nova Scotia region, Jonah crab is fished only June-November, when the lobster season is closed (DFO 1998A).

Product forms:

Jonah crab is commonly sold live, but Jonah “snap-‘n-eats” (pre-cooked, pre-cracked crab claws) are being heavily promoted by seafood processors (Clearwater Seafood 2002).

Import and export sources and statistics:

The U.S. exports no Jonah crab; all domestic landings are consumed within the U.S. (NMFS 2004a). Jonah crab is not broken out separately in National Marine Fisheries Service (NMFS) import statistics (NMFS 2004b), but most of Canada's Jonah crab catch is reportedly sold in the U.S. (DFO 2000).

Consumption information and trends:

Jonah crab is emerging onto the U.S. market as a substitute for blue crab and Dungeness crab. Reportedly, much of the Jonah crab caught in Canada is sold to the Red Lobster restaurant chain in the U.S. (DFO 2000).

Fishery Information

Fishery range and distribution:

Jonah crab is sought along the Atlantic coast from Maryland to Nova Scotia (NMFS 2004a; DFO 1998a; DFO 1998b).

Fishing effort and trends:

Jonah crab supports a low-volume, emerging fishery. According to statistics released by the Northwest Atlantic Fisheries Organization (NAFO), an international body to which both the U.S. and Canada belong, U.S. landings of Jonah crab totaled 1,245 metric tons (mt) in 2001 (NAFO 2002). In the same year, Canada's landings totaled 2,496 metric tons (NAFO 2002).

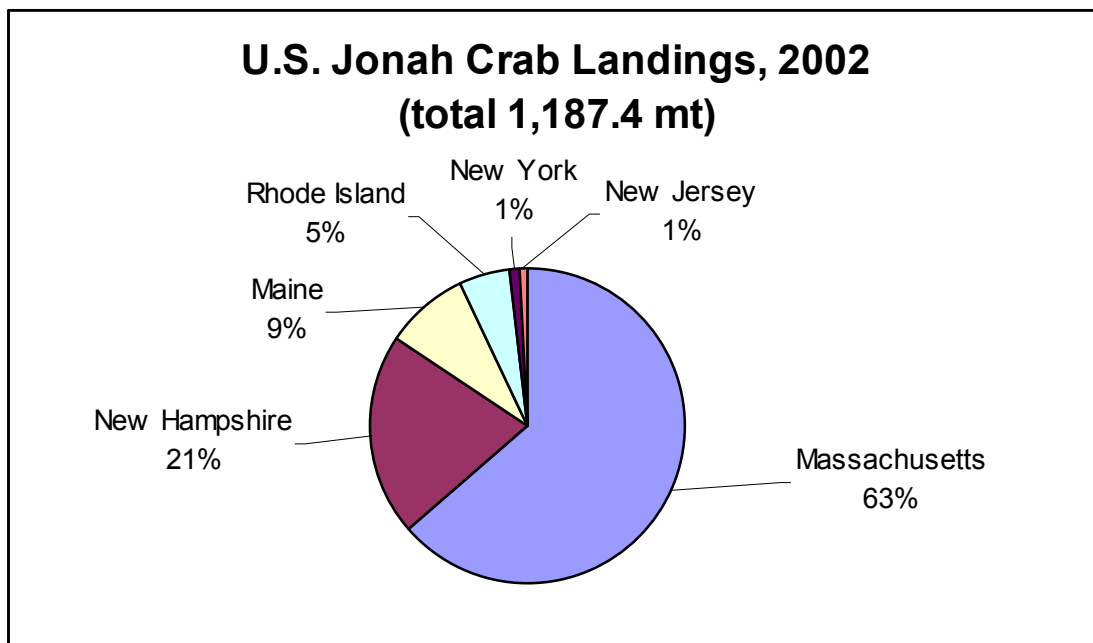


Figure 1: United States Jonah crab landings, by state, in metric tons, 2002. Source: NMFS Statistics

United States fishing effort and trends

Jonah crab was originally known only as bycatch in nearshore lobster fisheries (DFO 1998b). In the late 1980s, as stocks of the more popular crabs became depleted, New England fishermen began to experiment with alternatives. In 1990, Rhode Island landed 400.5 metric tons (mt) of Jonah crab, by far the largest share (NMFS 2004a). Maine was in second place, with 183.2 metric tons. Maryland, New Jersey, and New York each landed less than 10 mt of Jonah crab in that year (NMFS 2004a). By 1994, Delaware, New Hampshire, and Massachusetts had joined the

fishery. Maine's landings dropped below 25 mt and held steady around that figure for several years. Massachusetts has now taken the lead in Jonah crab landings (NMFS 2004a). In 2000, Massachusetts landed 612.2 mt, and New Hampshire landed 235 mt. Maine and Rhode Island each landed approximately 100 mt, New York approximately 25 mt, and Virginia, Connecticut, and New Jersey less than 10 mt each (NMFS 2004a). In 2002, the last year for which figures are available, Massachusetts landed 756.5 mt, New Hampshire 247.7 mt, Maine 101.2 mt, Rhode Island 58.1 mt, New York 15.8 mt, and New Jersey 8.3 mt (see Figure 1) (NMFS 2004a). These figures indicate an emerging fishery for Jonah crab, based in the New England region but flexible as to landings sites. Total landings, while small, have doubled in the last decade (NMFS 2004a).

Canadian fishing effort and trends




Canada's first directed fishing for Jonah crab took place in the 1980s (DFO 1998a; DFO 1998b; DFO 2000). In 1983 and 1984, an experimental fishery plied the Scotian Shelf (DFO 2000); by 1988, about ten boats were fishing for Jonah and red rock crab in remote areas of Canada's southeast Maritimes region (DFO 1998a; DFO 1998b). However, the price fishermen could get for Jonah crab did not make it worth their effort to travel to more remote fishing grounds (DFO 2000), and the fisheries collapsed after a few years (DFO 2000; DFO 1998a; DFO 1998b). In the mid-1990s, as market prices for Jonah crab improved, Canada revived the fishery as an alternate source of income in economically challenged areas of the remote Maritimes. Since 1997, Canada has licensed a small exploratory fishery (less than 20 vessels, limited-entry) in the southeast Maritimes (DFO 2000; DFO 1998a; DFO 1998b).

Analysis of Sustainability Criteria for Wild-caught Species

Criterion 1: Inherent Vulnerability to Fishing Pressure

Jonah crabs begin life as fertilized eggs, carried under the female's abdomen until they hatch. Eggs hatch into pelagic larvae that resemble shrimp more closely than adult crabs [2]. Adults look very similar to the closely-related red rock crab, but Jonah crabs are distinguished by the sharp spiny edges of their carapace (ACMSI 2002). Adults feed on a wide variety of plant and animal material, and are known to prey on echinoderms and blue mussels (Moody and Steneck 1993). Several sources report that Jonah crabs are relatively shy and retiring, showing themselves to be less aggressive than lobsters (NEFSC Fish FAQ 2002), red rock crabs, and the introduced European green crab (Moody and Steneck 1993). Jonah crabs tend to feed mostly at night, and often drag clumps of mussels back to a sheltered burrow to feed out of reach of the more aggressive crustaceans that share their habitat (Moody and Steneck 1993).

Biological reference points, such as maximum sustainable yield (MSY), mortality, and fecundity, have not been defined for any Jonah crab fishery, although fecundity is thought to be high. Other life history characteristics such as age at 1st maturity and maximum age are unknown for Jonah crab at this time. The species has a limited range, but has no known behaviors that increase its vulnerability to fishing pressure. At this time Jonah crab's inherent vulnerability to fishing pressure is considered neutral.

Inherent Vulnerability Rank: Resilient  Neutral  Vulnerable 

Criterion 2: Status of Wild Stocks

United States Jonah crab stocks have never been assessed, due to the absence of fishery-independent stock data. Canada's Department of Fisheries and Oceans (DFO) has performed a preliminary stock assessment on Scotian Shelf Jonah crab populations (DFO 2000). Abundance and trends data are not yet available for any Jonah crab populations, which, like other crustacean populations, are highly variable. Populations of Jonah crab can be abundant for many years, then scarce for years, before starting the cycle over again. Catch is the only index of abundance in most Jonah crab fisheries (NMFS 2002; DFO 1998a; DFO 1998b).

Status of U.S. stocks




No information has been published on the status of Jonah crab stocks in United States waters. Over the last decade, U.S. Jonah crab landings have averaged about 1000 metric tons per year (NMFS 2004a). The fishery is expanding gradually and catch appears to be holding steady (NMFS 2004a).

Status of Canadian stocks

Based on landings reports, and on size and abundance data collected by fishermen, Jonah crab stocks appear to be holding steady in all of Canada's management regions (DFO 1998a; DFO 1998b). From data reported by fishermen taking part in exploratory fisheries, DFO concluded that in Scotian Canada catch-per-unit-effort (CPUE) remained steady between 1997 and 1999 (DFO 2000).

Synthesis

Population abundance for Jonah crab is unknown in both U.S. and Canadian fisheries; however, overfishing is not thought to be occurring due to steady landings and the small size of the fisheries. Only limited, fishery-dependent data on the status of Jonah crab stocks are available, and the long-term trend in population abundance ranges from variable to unknown. The status of Jonah crab stocks, therefore, ranks as moderate or unknown.

Status of Stocks Rank: Resilient  Moderate or Unknown  Vulnerable 

Criterion 3: Nature and Extent of Bycatch


Seafood Watch® defines sustainable wild-caught seafood as marine life captured using fishing techniques that successfully minimize the catch of unwanted and/or unmarketable species (i.e., bycatch). Bycatch is defined as species that are caught but subsequently discarded (injured or dead) for any reason. Bycatch does not include incidental catch (non-targeted catch) if it is utilized, accounted for and/or managed in some way.

Jonah crabs are generally captured using circular steel traps, or pots (DFO 1998 A; DFO 1998 B). In some fisheries, pots are deployed individually; in other fisheries, they are attached at intervals along a groundline. All U.S. and Canadian fisheries require that pots contain devices to allow sublegal and female crabs to escape, and biodegradable web to minimize "ghost fishing" if pots are lost (ADF&G 1996; DFO 1998a; DFO 1998b). Though, to date, research has not revealed what percentage of Jonah crab on the U.S. market is taken in the United States' Northeast and mid-Atlantic lobster fishery, Wilson (2004) suggests that the majority of Jonah crab landings are from the lobster fishery.

Jonah crab traps take little finfish bycatch of any kind (DFO 1998b), and most unwanted catch is undersized or female Jonah crabs. Survivability of these animals is very good when released from traps (Wilson 2004). The Atlantic lobster fishery, however, has been listed by the National Marine Fisheries Service (NMFS) as having rare but serious interactions with protected species of marine mammals, including northern right whale, humpback whale, fin whale, minke whale, and harbor seal (NMFS US MMP 2001). These mammals have been observed entangled in trap lines. Some 13,000 fishermen take part in the Atlantic lobster fishery (NMFS US MMP 2001). As Wilson (2004) has suggested that the majority of Jonah crab is caught in the Atlantic lobster fishery, bycatch for the Jonah crab fishery is deemed to be a similar conservation concern as that for the lobster fishery, and is ranked as a high conservation concern.

Nature of Bycatch Rank:

Low 

Medium 

High 

Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems

Because the majority of Jonah crab is taken as incidental catch in the East Coast lobster fisheries (Wilson 2004), habitat effects are extrapolated from the studied effects of lobster trapping.

American lobsters are primarily caught using pots (Table 4). The results of an expert panel workshop concluded that traps and pots impact the biological and physical structure of the ocean bottom (Northeast Region Essential Fish Habitat Steering Committee 2002). Lobster pots impact an area two to three times larger than the actual footprint of the lobster pot due to dragging when the pots are set and retrieved, and although the impact of an individual pot may be minimal, the cumulative impact of more than four million lobster pots is cause for concern (Northeast Region Essential Fish Habitat Steering Committee 2002).

Table 4. Habitat effects of gear used to harvest American lobster.

Gear type	Effect of fishing gear on habitats	Habitat resilience to disturbance	Geographic extent of fishery effects	Evidence of food web disruption	Evidence of ecosystem changes	Sources
Lobster traps/pots	Moderate	Moderate	Moderate	None	None	Northeast Region Essential Fish Habitat Steering Committee 2002

Synthesis

Lobster pots have a moderate effect on ocean bottom habitat, and the resilience of the bottom habitat is considered moderate to high, depending on the bottom habitat. The spatial scale of impact is moderate. There is no evidence that the fishing method used or the removal of American lobster, or Jonah crab, has substantially disrupted the foodweb. Overall, the effect of fishing practices in the American lobster fishery, and therefore in the Jonah crab fishery, rates as a moderate conservation concern.

Effect of Fishing Practices Rank:

Benign 

Moderate 

Severe 

Criterion 5: Effectiveness of the Management Regime

Management of United States fisheries

U.S. fisheries are managed by the state fisheries authorities of the several states with Jonah crab fisheries. The basic management strategy is to catch only mature males that have had a chance to breed (DFO 2000).

Management measures include:

- Size limits
- Sex limits
- Closed areas
- Fishing seasons
- Limits on the number of traps
- Limits on trap size and configuration

The State of Maine is in the process of designing a proactive management regime for Jonah crab, in anticipation of future expansion of the fishery (Wilson 2004).

Monitoring and enforcement in United States fisheries

Responsibility for monitoring and enforcement falls to state fish and game authorities in each state where Jonah crab is landed.

Management of Canada’s fisheries

Canadian Jonah crab fisheries are managed by Canada’s federal fishery authority, the Department of Fisheries and Oceans (DFO 1998a), under an integrated fisheries management plan that covers Jonah crab and red rock crab in the Canadian Maritimes region. There are separate management plans in place for two major Jonah crab fishing areas: southwest New Brunswick, and southwest Nova Scotia (DFO 1998a; DFO 1998b).

Management measures include:

- Limited entry
- Size limits
- Sex limits
- Prohibition on retention of softshells
- Fishing seasons
- Limits on the number of traps
- Limits on trap size and configuration

Entry into the Jonah crab fishery is limited. Size is restricted to 121 mm minimum carapace width, and sex is restricted to males only. Retention of softshelled crabs is prohibited. Seasonal and area closures aim to avoid conflict with the lobster fishery, which is conducted in the same areas (and, often, by the same fishermen) (DFO 1998a; DFO 1998b). Escape rings and biodegradable mesh, as well as buoy markings and trap tags, are required on traps (DFO 1998a; DFO 1998b).

Monitoring and enforcement in Canadian fisheries

Canada uses a system of logbooks and fish tickets to monitor commercial catches. Jonah crab is still an exploratory fishery in the Canadian Maritimes, and all participants are required to offer 100% of their catches for dockside inspection (DFO 1998a; DFO 1998b) and report catch, size, and abundance data to management authorities (DFO 2000; DFO 1998a; DFO 1998b).

Synthesis

Stock assessments have not been conducted for either U.S. or Canadian Jonah crab fisheries. Stock assessments are planned, but are incomplete at this time. Management to date has only regularly collected fishery-dependent data on Jonah crab. Systematic collection of fisheries-independent data has recently begun, but is not yet “regularly collected”. Bycatch plans are in place, but effectiveness of these plans is not yet demonstrated. Measures are also in place to mitigate effects of fishing on habitats and ecosystems; however, the effectiveness of these measures has not yet been demonstrated. Regulations are regularly enforced, and logbook reports, observer coverage, and dockside monitoring are required. Management of the Jonah crab fisheries has not been in place long enough, however, to thoroughly evaluate its effectiveness. The management regime for Jonah crab therefore ranks as moderately effective.

Effectiveness of Management Rank:

Highly Effective 

Moderately Effective 


Ineffective 

Overall Evaluation and Seafood Recommendation


A lack of basic biological data on the life history characteristics of Jonah crab warrants a rank of moderate conservation concern regarding the inherent vulnerability of this species. While stock assessments have never been done for Jonah crab, abundance, as measured by catches, appears stable, though there is great uncertainty in this assertion. The Jonah crab fishery is limited to the catch of mature males only, and survivability of released undersized and female crabs is good. Jonah crabs are normally caught with traps or other highly selective gear and much of the Jonah crab landed is taken as incidental catch in the trap fisheries for American lobster. Bycatch in these fisheries is of high concern because of regular but low-frequency interactions with the critically endangered right whale and other marine mammals. Habitat concern is moderate, as lobster traps deployed in coldwater rocky areas are believed to cause some habitat damage, and the lobster fishery is of wide-area extent. Management of the small-scale Jonah crab fishery is deemed moderately effective because of a bycatch plan of uncertain efficiency, a short-term record of management success, and a lack of stock assessments. Taken together, these factors result in an overall recommendation of “Good Alternative” for Jonah crab.

Overall Seafood Recommendation:

Jonah crab:

Best Choice 

Good Alternative 

Avoid 

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