Seafood Watch

Seafood Report

MONTEREY BAY AQUARIUM®

California Spiny Lobster

Panulirus interruptus

(Image © B. Guild Gillespie/www.chartingnature.com)

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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 1-877-229-9990.

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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Introduction to Series on Spiny and Rock Lobsters:

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

Volume Index:

General Lobster Biology

Lobsters belong to the order Decapoda, a crustacean order which also includes the shrimps, true crabs, and hermit crabs. All decapods possess a full carapace or head shield, and, eponomously, ten walking legs (five pairs) [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 to grasp and manipulate food [Watanabe, 2001]. Lobsters are distinguished from the other decapods by their long “tails” (actually, the abdominal segment) [Bliss, 1982]. The lobster group, known as Reptantia for their crawling motion, consists of the spiny and rock lobsters, the slipper lobsters, the “true” lobsters, and the freshwater crayfishes [Bliss, 1982]. There are two types of lobsters: the “true” lobsters (infraorder Astacidia) and the spiny/rock group (infraorder Palinura) [Bliss, 1982]. “True” lobsters, including the American and European lobster, have two large claws in front and a rigid, hard-shelled tail fan [Bliss, 1982]. Freshwater crayfishes closely resemble the true lobsters and are placed in the same infraorder [Bliss, 1982]. Spiny, rock, and slipper lobsters lack enlarged front claws, but have a thick, muscular tail and a leathery tail fan adapted for swimming [Bliss, 1982].

As arthropods, lobsters 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; Bliss, 1982].

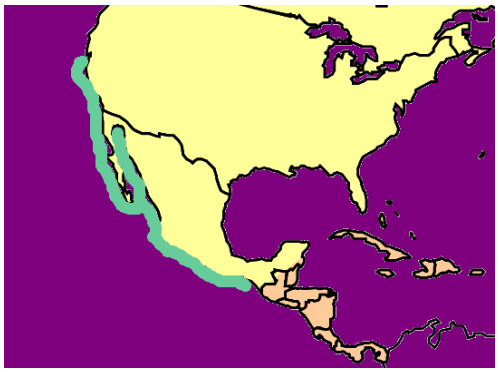
Executive Summary:
The California spiny lobster is the subject of a small but locally-important commercial fishery based in southern California, as well as a well-established recreational fishery. The species is fecund and inherently resilient to fishing pressure. Status of stocks is technically "unknown", as there have not yet been formal stock assessments, but the population is presumed healthy based on 83 years of landings data. Basic studies of population ecology and habitat use are just beginning. In the commercial fishery, short- and long-term trends in CPUE are upwards. However, catch and effort statistics are not kept on recreational effort, and so the impact of the recreational fishery upon the population is entirely unknown. Bycatch is low in this trap fishery, and there is no evidence that this fishery is damaging habitat. While only fisheries-dependent data is regularly collected, this data covers an extremely long time series. Management has maintained stock productivity and limited ecosystem change, acting proactively to respond to stock declines in the past. A fisheries management plan for this species is currently being developed.

List of Five Component Ranks	Green	Yellow	Red	Avoid
Inherent Vulnerability	√			
Status of Stocks		√		
Bycatch	√			
Habitat Effects	√			
Management Effectiveness	√			

Overall Seafood Rank: **Best Choices**

A portion of the Baja California red rock lobster (also known as California spiny lobster, Panulirus interuptus) trap fishery has been certified as sustainable to the Marine Stewardship Council (MSC) standard. The MSC is an independent non-profit organization, which has developed an environmental standard for sustainable and well-managed fisheries. It uses a product label to reward environmentally responsible fishery management and practices (http://www.msc.org/).

The California Spiny Lobster, *Panulirus interruptus*



Left: California spiny lobster in typical Central California den habitat (note orange cup corals). Photo from www.livingthings.narod.ru/Clt/Ani/ Art/Cru/Pal/pal002.jpg
Right: range of the species. Map by A. Cascorbi.

The California spiny lobster occurs further north than most other panulirids [Bliss, 1982]. The extreme ends of its range are Monterey Bay, California to the north and Mexico's Gulf of Tehuantepec to the south [Bliss, 1982], although most of the population is found between Point Conception, California and Magdalena Bay, Baja California [CA DFG, 2001]. The waters of Monterey Bay are too cold for this lobster to breed, and scientists presume that all adults found in central California arrive as pelagic larvae during El Nino years [Webster, 2002, pers. comm].

Despite its importance to regional fisheries of both Southern California (USA) and Mexico, little basic research has been conducted on the life history, population structure, and habitat needs of *P. interruptus* [Hovel, 2003]. The descriptions that follow are based on the few peer-reviewd reports available, plus agency literature and personal communications with scientists.

Adult *P. interruptus* favor rocky underwater habitat, but also forage on sandy substrates [CA DFG, 2001], in beds of surfgrass and ellgrass, and in the intertidal zone [Hovel, 2003; Robles, Sweetnam, and Eminike, 1990]. They hide in rock dens during the day and search for food at night [CA DFG, 2001]. Beds of eelgrass and surf grass (*Zoster* spp.; *Phyllospadix* spp.) may be vital nursery habitat for juveniles [Cobb&Wang, 1986; Bliss, 1982]; although attempts to confirm this for *P. interruptus* near San Diego were not conclusive [Hovel, 2003, unpublished data], eelgrass beds are known to be important nursery habitat for other species of spiny lobster [Hovel, 2003]. Each autumn in Southern California, age 2+ juveniles are believed to move out of the grass beds to deeper water. At the same time, new larvae are assumed to be settling into the grass beds [Cobb & Wang, 1985]. As most breeding of *P. interruptus* takes place off the Mexican coast, it is assumed that the southern California stock is replenished by larvae carried north each year by strong countercurrents [Cobb & Wang, 1985].

Abundance of California spiny lobsters may be strongly influenced by weather and oceanographic events, including El Nino/La Nina [Pringle, 1986; CA DFG, 2001]. Pringle (1986) provides evidence for countercurrents transporting lobster larvae north to the San Diego region from the open ocean; this transport may be strengthened in El Nino years [Pringle 1986; Hovel 2003].

Stimulated by changes in water temperature, a large portion of the California spiny lobster population makes an annual migration offshore into deep waters for the winter and back inshore to spend the spring and summer [CA DFG, 2001]. California spiny lobsters are gregarious and tend to share dens with conspecifics [Zimmer-Faust & Spanier, 1987].

California spiny lobsters are egg-layers that produce between 120,000 and 680,000 eggs per year, depending upon the size of the female [CA DFG, 2001]. Females carry the fertilized eggs on their abdomen for about 10 weeks until the eggs hatch into pelagic larvae [CA DFG, 2001]. Females tend to carry eggs in May and June--the lobster fishing season, which runs October through March, has been set to avoid the peak breeding season [CA DFG, 2001].

California spiny lobsters reach breeding maturity (2 ½ inches carapace length) before they reach the minimum legal size for the fishery (3 ¼ inches carapace length) [CA DFG, 2001]. Growth rate and the period between molts is extremely variable, but it takes a minimum of 3 years for lobsters to reach sexual maturity, and, depending upon water temperature and food availability, lobsters in some areas do not mature until age 5 or 6 [Barsky, 2003]. However, given average growth rates, it takes 7 to 11 years for California spiny lobsters to reach legal size [CA DFG, 2001]. This means that California spiny lobsters probably have one or two seasons to breed before they become legal targets of the fishery [Hovel, 2003].

P. interruptus plays an important role as a predator in intertidal and subtidal communities [Hovel, 2003]. Lobster predation on mussels and urchins is an important factor in maintaining diverse communities in these habitats [Tegner and Levin, 1983; Robles, Sweetnam & Eminike, 1990]. In California's Anacapa Island marine reserve, where lobster fishing is prohibited, not only are spiny lobsters larger and more abundant than outside the reserve, but the kelp forest ecosystem is more stable, thanks to lobster predation upon kelp-eating sea urchins [PISCO, 2002].

Statement on the Availability of Science, California Spiny Lobster:
As of 2003, there had not yet been a systematic stock assessment of California spiny lobster, nor was this species covered under a federal Fisheries Management Plan [CA DFG, 2001; NMFS 2002 Report to Congress, 2003; Hovel, 2003]. As of 2003, there have been no fisheries-independent assessments of population size and structure for this species [Hovel, 2003]. This relatively small fishery has been tracked through commercial landings since 1916 [CA DFG, 2001]. Over the decades, the California DFG has used landings data to make regulatory decisions [CA DFG, 2001]. Those decisions seem to have kept the commercial stock healthy, in that landings have never suggested stock depletion [CA DFG, 2001]. In this situation, basic population studies have not been an urgency for the agency. Therefore, stock parameters such as MSY, BMSY, and FMSY remain undefined for this species. In 2002, two researchers from San Diego State University began the first systematic study of California lobster abundance and recruitment; their preliminary results (defining habitat use by lobsters of various ages) were reported in December 2002 at the annual meeting of the Western Society of Naturalists [Hovel and Mai, 2002]. These researchers are also presently estimating

lobster density in rocky subtidal habitats and assessing factors that influence lobsters' den selection [Hovel, 2003].

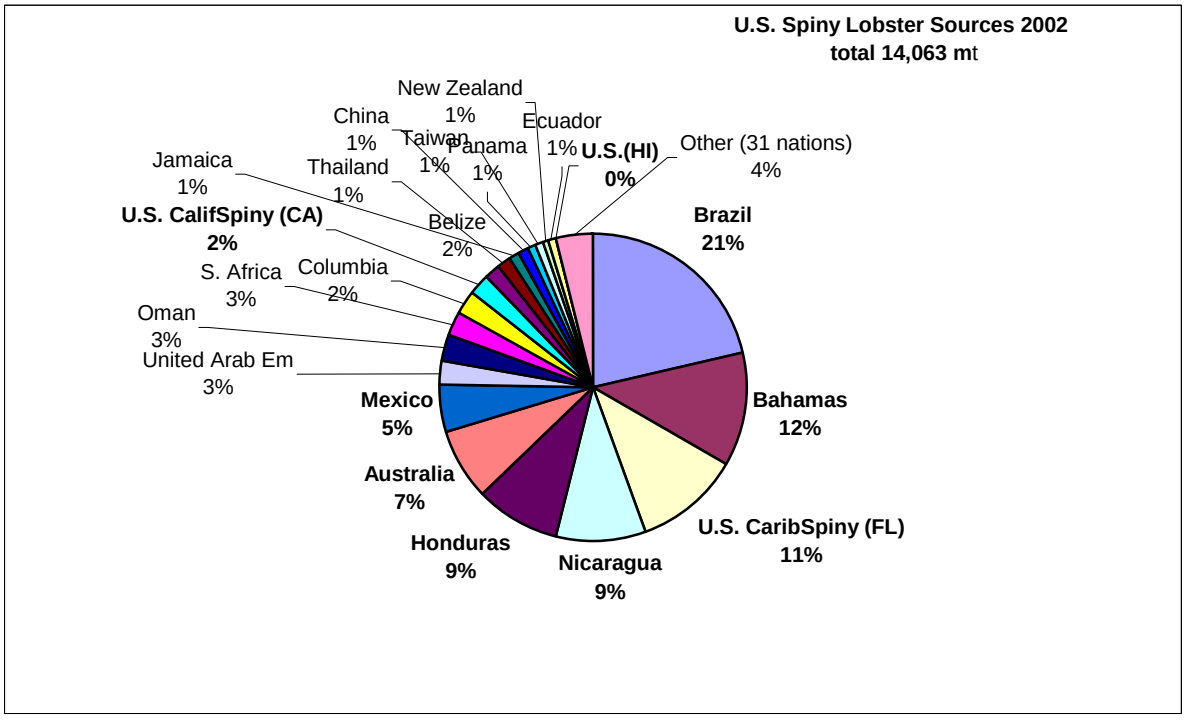
Market Information: California Spiny Lobster

Market Names: Spiny lobster, California spiny lobster

Seasonal Availability, California Spiny Lobster:
Frozen tails year-round. Live lobster October to mid-March [Farm2Market.com, 2002], which is the California lobster-trapping season [CA DFG, 2001].
The majority of the catch is always taken in October [CA DFG, 2001].

Market Sources and Statistics, California Spiny Lobster:
Among domestic fisheries, *P. interruptus* is landed commercially only in California [NMFS Stats, 2003]. In recent years, most of the catch has been marketed in Asia and France; California fishermen have received between $6.75 and $8.00 per pound from dealers from these foreign markets. However, since 2000, depressed economies overseas have led California lobster fishermen to attempt to re-establish domestic markets [CA DFG, 2001].

In 2002, the last year for which data are complete, U.S. landings of California spiny lobster were 706,866 pounds, or 320.6 metric tons [NMFS Stats 2003]. This means that California spiny lobster accounts for about 2% of the total U.S. spiny lobster market [NMFS Stats 2003].



Data Source: NMFS Stats, 2003. ***Note: "0%" means less than 1%.***

Fishery Information, California Spiny Lobster

All commercial fishing for *P. interruptus* takes place south of Point Conception, California [Bliss, 1982]. The species reaches its greatest density off Baja California, Mexico [Bliss, 1982]. Nonetheless, there are enough of these lobsters to support an important fishery in southern California (USA). Significant amounts of lobster are landed in Los Angeles County, Ventura County, and Orange County, with the largest fraction of landings take place in San Diego County, but [CA DFG, 2001; Barsky, 2003].

Fishing Methods, California Spiny Lobster:

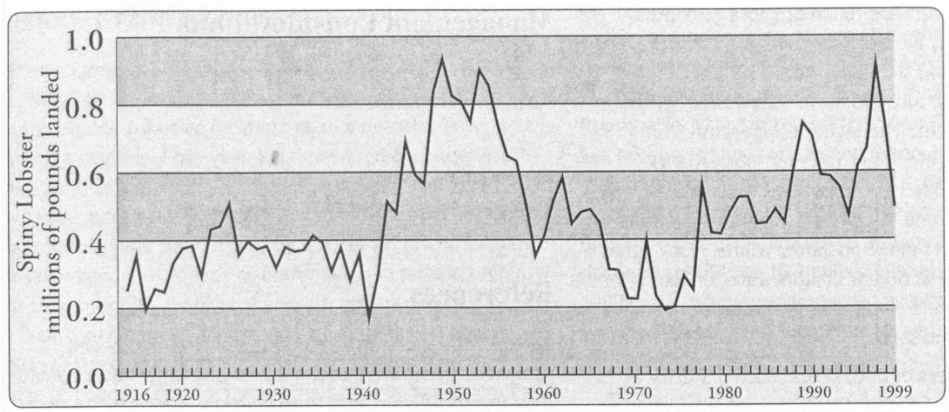
California spiny lobsters are caught in traps, made either of wire mesh or plastic [Bliss, 1982; CA DFG, 2001]. The traps are required to have a destruct device to open lost traps [CA DFG, 2001]. Since 1976, traps have also been required to contain an escape port for undersized lobsters [CA DFG, 2001].

Boats used in the California fishery range from 15-foot skiffs to 50-foot fishing vessels, with many lobster fishermen using 20- to 40-foot speedboats [CA DFG, 2001]. Most California lobster boats are equipped with hydraulic trap haulers to assist in lifting the 100 to 500 traps each fisherman deploys [CA DFG, 2001].

Fishing is conducted in shallow, rocky areas. The traps are placed along depth contours in water less than 100 feet deep, or clustered around rocky outcrops on the bottom [CA DFG, 2001]. Each year, at the beginning of the season, lobsters are plentiful (and traps are set) in water less than 100 feet deep, but fishermen move the traps deeper as the season progresses, ending up as deep as 300 feet [CA DFG, 2001]. California fishermen use electronic equipment to locate lobster habitat and set their traps there [CA DFG, 2001].

Fishing Effort and Trends, California Spiny Lobster:

Landings of California spiny lobster have been tracked since 1916 [CA DFG, 2001]. fishing effort is influenced strongly by the export market [CA DFG, 2001]. Landings were steady in the range of 200,000- 400,000 pounds per year before World War II. After the war, fishing effort intensified, and annual landings peaked in 1950 at 1.05 million pounds [CA DFG, 2001]. Landings then declined gradually until 1975, when the fishery reached its record low of 152,000 pounds. In 1976, managers introduced a requirement for escape ports on traps to protect undersized lobsters. The downward trend reversed within three years. Landings ranged between 400,000 -500,000 lbs./year 1979-1988 and 600,000-950,000 lbs./year 1989-1998. The escape port is credited with reversing a stock decline and preserving both stocks and fishery [CA DFG, 2001].



Commercial Landings 1916-1999, Spiny Lobster
Data Source: DFG Catch Bulletins and commercial landing receipts.

Management, California Spiny Lobster:
Over the decades, the California DFG has used landings data to make regulatory decisions [CA DFG, 2001]. Those decisions seem to have kept the commercial stock healthy, in that landings have never suggested stock depletion [CA DFG, 2001]. In this situation, basic population studies have not been an urgency for the agency. Therefore, stock parameters such as MSY, BMSY, and FMSY remain undefined for this species.

However, over the history of the fishery, management has tracked landings, and taken a critical step (the 1976 requirement for escape ports on traps) that contributed to a revesal of the downward decline in lobster landings (and, by implication, in population abundance) [CA DFG, 2001; Hovel, 2003]. Management measures in place as of 2001 include a fishing season set to avoid the lobsters' prime breeding time; a minimum size limit that allows lobsters several seasons to breed before they reach catchable size; gear restrictions to protect undersized lobsters and to minimize "ghost fishing"; and limited-entry licensing for commercial fishers [CA DFG, 2001]. While critical habitat for this species is still in the process of being defined [Hovel and Mai, 2002], several marine reserves off Southern California provide no-fishing refuges for this species [CA DFG, 2001]. These no-take zones, which include the Santa Catalina island reserve and the La Jolla ecological reserve , might be considered a "management measure" which benefits the species. Managers track landings through logbooks [CA DFG, 2001].

The limited-entry program, instituted in 1997, was designed in cooperation with the California Lobster and Trap Fishermen's Association. The DFG credits this industry organization with cooperation in efforts to retrieve lost traps and improve regulations [CA DFG, 2001]. In 2001, the DFG called for a formal review of the limited-access fishery, to address issues such as permit transferability [CA DFG, 2001]. This is seen as an interim measure on the road to producing a full Fishery Management Plan (FMP) for California spiny lobster [CA DFG, 2001].

California spiny lobsters support a recreational fishery; this fishery is unmonitored and largely unpatrolled by enforcement agents [Hovel, 2003], and its exact size is not known to managers [Barsky, 2003]. Some managers believe that the recreational take is minimal compared to the commercial take [CA DFG, 2001]. Recreational fishers must observe the same size limits as the commercial fishery, and although the recreational season opens one weekend before the commercial season [CA DFG, 2001], both seasons close in mid-

March to avoid the breeding peak in May and June [CA DFG, 2001]. Recreational fishers have gear restrictions and a seven-lobster daily bag limit (reduced from 10 lobsters per day in 1971). However, it should be noted that there is great uncertainty about the extent of the take of undersized lobsters in the recreational fishery; this could be a serious impact of recreational fishing upon the total population, though the specifics are completely unknown [Hovel, 2003].

A Note on Outside Review:

Seafood Watch is indebted to the outside experts who graciously volunteered their time to review the facts presented in this report for completeness and scientific accuracy: Dr. Kevin Hovel, University of California San Diego; and Kristine Barsky, California Department of Fish and Game. **It is important to note that scientific review does not constitute an endorsement of Seafood Watch on the part of the reviewing scientists; the Seafood Watch staff is solely responsible for the conclusions reached in this report.**

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