

# Pacific sardine

*Sardinops sagax*

## BIOLOGY FACT SHEET



Photo: sardineking.com

## San Diego seafood profiles

### Taxonomic description

- Small schooling fish with a silver body and dark spots on its back
- Can grow to 16" (41 cm) long, but are regularly seen less than 12" (30 cm)
- One of the 18 species of the herring family found worldwide [1]
- At times as been the most abundant fish species in the California Current [1]

### Distribution

- Worldwide, found in the subtropical and temperate waters of the Pacific and Indian Oceans and in the Atlantic by South Africa [2]
- Along western North America, found from the Gulf of California to southeastern Alaska [1]

### Life history

- Can live as long as 14 years old, however, 90% of the population is younger than 6 years old. [1]
- Sardine matures when smaller and by age 1 during years of low total biomass, and when larger and older ( $\geq 2$  yrs old) in years of high total biomass [1]
- Spawning occurs in schools in the upper 50 m (165 ft) of the water column [1]
- Most spawning occurs between 13°-17° C (55° - 63° F), with shifts northward and lasting for longer periods during warmer conditions
- Peaks in spawning are April - August in the north, and January - April in southern California

### Habitat

- A temperate, coastal pelagic fish (i.e., open water) [1].

- Migratory, traveling in very large schools but are an important prey item for marine life such as birds and larger pelagic fish [1]
- Filter feeders that feed on phytoplankton and zooplankton [2]

### References

- [1] Protasio, C. 2011. Pacific sardine, *Sardinops sagax*. Status of the Fisheries Report 2011. California Dept. Fish & Wildlife. <http://www.dfg.ca.gov/marine/status/>
- [2] Monterey Bay Aquarium, Seafood Watch - Pacific Sardine. [www.montereybayaquarium.org/cr/cr\\_seafoodwatch](http://www.montereybayaquarium.org/cr/cr_seafoodwatch)
- [3] Cabrillo Marine Aquarium. 2013. Pacific Sardine. [www.cabrillosmarineaquarium.org/exhibits/social-species-details.asp?id=21](http://www.cabrillosmarineaquarium.org/exhibits/social-species-details.asp?id=21)

### Did you know?

Overcrowded classrooms: The Pacific sardine forms schools of up to 10 million fish [3]!



UC San Diego

# Pacific sardine

## FISHERY FACT SHEET

*Sardinops sagax*



Photo: Pacific Media Productions (PMP)

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### Seasonal availability

- Fishery open year-round [i]
- Landings fluctuate due to shifting environmental conditions associated with Pacific Decadal Oscillation & changes in sea surface temperature [ii]

### Managing authority

- NOAA Fisheries Service manages the fishery under the Coastal Pelagic Species Fisheries Management Plan, which was implemented by the Pacific Fishery Management Council (PFMC) [iii]

### Gear type

- Round haul gear (purse seines, drum seines, & lampara nets) used to encircle schools (iii)
- Seines/nets are dragged through the water column, limiting the potential for disrupting the ocean bottom [ii]

### Status of the fishery

- NMFS Fish Stock Sustainability Index classifies the stock as a “4” out of 4, reflecting that the stock has known status, is not overfished or subject to overfishing, & maintains a biomass at or above maximum sustainable yield [iv].
- Fishery declined and collapsed from the late 1940’s to late 1980’s due to several heavily-debated factors. In 1999 after a moratorium, the fishery was deemed “fully recovered” [iii]
- The PFMC sets an overfishing limit, an acceptable biological catch, & an annual catch target [i].

### Potential ecosystem impacts

- Although fishing efforts may catch non-target species, most are sold for human consumption (i.e. Pacific Mackerel); discarded “bycatch” makes up <1% of landings [ii]
- A significant reduction in the amount of forage fish biomass, such as sardines, can disrupt ecosystem functioning given that they transfer plankton into a food source for higher trophic level organisms [ii]

- Sardine biomass is negatively correlated with that of anchovy, which flourish under “warm regime” Pacific Decadal Oscillation conditions. If sardine stocks are low enough, anchovies may fill the vacant ecological niche [ii].

### References

- [i] Pacific Fishery Management Council. 2012. Coastal Pelagic Species: Current Season Management.
- [ii] Hislop, K. 2013. Seafood Watch: Pacific Sardine Report. Rep. Monterey Bay Aquarium.
- [iii] Protasio, C. 2011. Pacific Sardine. Status of the Fisheries 2011. California Dept of Fish & Wildlife. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=65547&inline=true>
- [iv] NOAA National Marine Fisheries Service. 2008 Status of the Fisheries. United States Department of Commerce.
- [v] NOAA, National Marine Fisheries Service. 2013. 2nd Quarter 2013 Update. United States Dept of Commerce.
- [vi] Lindgren, M., et al. 2013. Climate, fishing & fluctuations of sardine and anchovy in the California Current. PNAS . <http://www.pnas.org/content/early/2013/07/05/1305733110.full.pdf>

### Did you know?

The sardine fishery collapse of the 1950’s may not have been solely due to overfishing as was long thought, but due to climate change and/or natural long-term fluctuations of fish populations [vi].

# Pacific sardine

## NUTRITION FACT SHEET

*Sardinops sagax*



slow grilled sardines by mark bittman

www.more.com

## San Diego seafood profiles

### Edible portions

- May be eaten whole or after scaling and gutting the fish.

### Culinary uses

- When buying local, fresh sardines look for bright eyes, shiny skin, firm to the touch and a fresh smell [2,4]
- Good advice: never freeze fresh sardines!
- Can be used in numerous delicious, easy dishes, such as ceviche, fish tacos, salsas, tomato sauces for pasta, smoked sardine pâté, and on pizza
- Simplicity is key! Some easy preparation ideas include [4,5]:
  - marinate in salt, olive oil, & lemon juice; then grill, pan-sear, or broil
  - combine with onions, olives & fennel
  - top with chopped tomato, & rosemary, basil or oregano

### Toxicity report

- No known contaminants.

### Nutritional information

Fresh (3.5 oz) [1]

Nutrition Facts	
Serving Size 100 grams (100g)	
Amount Per Serving	
Calories 125	Calories from Fat 45
%	
Total Fat 5g	
Saturated Fat -	
Cholesterol -	
Sodium -	
Total Carbohydrate 0g	
Dietary Fiber -	
Sugars -	
Protein 20g	
Vitamin A -	Vitamin C -
Calcium -	Iron -

\* Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

- Promotes good cardiovascular health- rich in omega-3 fatty acids, vitamin B12, EPA, & DHA, which lower triglyceride & cholesterol levels, and reduce risk of atherosclerosis [4,5]
- Promotes good bone health- rich in vitamin D, which aids uptake of calcium [4,5]
- Is a great, inexpensive source of protein [4]

### Description of meat

- Smaller sardines have a delicate flavor, while the larger ones have a fuller, oilier taste that is similar to (but milder than) anchovies [4].

### Seasonal availability

- Available fresh year-round [2,3]

### References

- [1] Fat Secret: All things food and diet. 2013. Fresh sardines. [www.fatsecret.com/Diary.aspx?pa=fjrd&rid=72915](http://www.fatsecret.com/Diary.aspx?pa=fjrd&rid=72915)
- [2] Fish Watch. 2012. US Seafood Facts, National Oceanographic and Atmospheric Administration [www.fishwatch.gov/seafood\\_profiles/species/sardine/species\\_pages/pacific\\_sardine.htm](http://www.fishwatch.gov/seafood_profiles/species/sardine/species_pages/pacific_sardine.htm)
- [3] Protasio, Chelsea. 2011. Pacific Sardine, *Sardinops sagax*. Status of the Fisheries Report 2008. California Department of Fish and Wildlife. 28 July 2013. <http://dfg.ca.gov/serp.html?q=pacific+sardine&cx=001779225245372747843%3A3y4rnp6j9ny&cof=FORID%3A10&ie=UTF-8&siteurl=http%3A%2F%2Fdfg.ca.gov%2F>
- [4] The World's Healthiest Foods. 2013. The George Matelijan Foundation. <[www.whfoods.com](http://www.whfoods.com)>
- [5] The Super Green List. 2013. Monterey Bay Aquarium Seafood Watch. [www.montereybayaquarium.org/cr/cr\\_seafoodwatch/stw\\_health.aspx](http://www.montereybayaquarium.org/cr/cr_seafoodwatch/stw_health.aspx)

### Did you know?

Sardine is considered one of the healthiest foods in the world [4]!





# Pacific sardine

CULINARY  
INFO SHEET

*Sardinops sagax*

## STEP 1: CLEAN

### Tools:

- Cutting Board
- Paring Knife

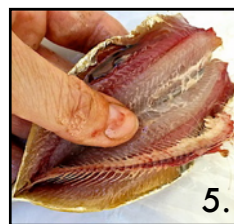
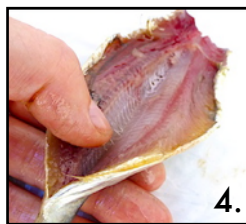


Photo Credit: frugal-foodie-recipes.com [1]

### Method:

1. **SCALE** Drag the back of the knife from the tail to head to remove the scales.
2. **CLEAN** Beginning at the anus, make a slit down the entire length of the underside and remove innards, rinsing as needed.
3. **TRIM** Slice off the head and fins.
4. **BUTTERFLY** Create a fillet by opening both sides of the fish.
5. **DEBONE** Starting in the upper body, gently remove the ribs, backbone, and tail from the flesh by pulling upward.
6. **TIDY** Remove any stray bones remaining in the fillet by hand.

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## STEP 2: PREPARE

**TIP:** Sardines are done cooking when they are opaque, browned, and the tip of a knife easily flakes the thickest part.

### Appetizer | Grilled Sardines

Adapted from [wholeliving.com](http://wholeliving.com) [2]

#### Ingredients (serves 4):

- 1 lb. fresh sardines (~8 fish), cleaned
- 1 tbsp. + 2 1/2 tsp. extra virgin olive oil
- 3/4 tsp. sea salt
- 1/4 tsp. pepper, freshly ground
- 6 in baguette, cut into 16 thin slices
- 1 clove of garlic
- Vegetable oil cooking spray
- 1 lemon, sliced into wedges



Photo Credit: Lara Robby, [wholeliving.com](http://wholeliving.com) [2]

#### Method:

1. Coat sardines using 1 tbsp. of oil.
2. Season with 1/2 tsp. salt and 1/8 tsp pepper.
3. Rub clove of garlic on cut slices of bread and dress with remaining oil, salt, and pepper.
4. Coat grill pan with cooking spray and heat to medium-high.
5. Grill sardines for 2 mins. per side, or until cooked through.
6. Grill bread for 1 min. per side.
7. Serve on a platter with bread and lemon wedges.

### Entree | Broiled Sardines with Lemon and Thyme

Adapted from [nytimes.com](http://nytimes.com) [3]

#### Ingredients (serves 4):

- 12 fresh thyme sprigs + garish
- 1 thinly sliced lemon + wedges
- Pinch of salt and pepper
- 3 tbsp. extra virgin olive oil
- 1 1/2 lbs. sardines (~12 fish), cleaned (may leave head + tail)



Photo Credit: [nytimes.com](http://nytimes.com) [3]

#### Method:

1. Adjust oven rack 2-4 inches from broiler. Place empty pan in oven and heat for 5 mins.
2. Wrap each thyme sprig in a lemon slice and stuff one into each sardine. Season with salt and pepper, to taste.
3. Remove pan from oven and pour in half of the olive oil. Place the sardines in the pan and drizzle with remaining oil.
4. Broil sardines for 4-5 minutes, or until cooked through.
5. Gently remove sardines with a spatula, pour the pan juices over them, sprinkle with thyme, and serve with lemon wedges.

#### SERVING SUGGESTIONS:

Sardines are best baked, broiled, or grilled\*.

\*Sardine skin is fragile. Use a buffer, such as grape leaves, to keep skin intact.

#### OTHER RECIPE IDEAS:

Over pasta with tomato sauce; sliced into a dressing; tossed in a salad, tapas; on a sandwich.



#### References

[1] d' Arville, June. Frugal Foodie. Available: [www.frugal-foodie-recipes.com/How-To-Clean-Fish.html](http://www.frugal-foodie-recipes.com/How-To-Clean-Fish.html)

[2] Martha Stewart Living. Whole Living. Available: [www.wholeliving.com/131909/grilled-fresh-sardines](http://www.wholeliving.com/131909/grilled-fresh-sardines)

[3] The New York Times. Available: [www.nytimes.com/2010/12/29/dining/29minirex.html](http://www.nytimes.com/2010/12/29/dining/29minirex.html)