



## “There are plenty more fish in the sea”?

There used to be some truth to that proverb. But statistics now show otherwise. In 2007, the United Nations estimated that 75% of the world’s **fisheries** were either fully-fished or overfished. That is a very high percentage, especially considering that an additional 32 million tons of seafood is projected to be needed by 2020. What is driving the increased demand? Factors include a growing global population, the expanded market need of developing nations and trendiness and affordability prompted by the recognized health benefits of seafood.

So what are some solutions? **Aquaculture**, or “farmed” fish, has been one answer. Nearly half of the world’s fish are now raised like chicken or cattle. Some fish farming takes place in outdoor ponds or in cages placed directly in the ocean. Although many fish are produced, other problems may crop up. Net pens, or cages, can pollute the surrounding environment when effluent (waste water) and non-native fish escape. Sometimes large amounts of feed, made of wild fish, is needed to grow the farmed fish. Fish ponds and closed-water recirculating systems are sometimes considered better for the environment because waste water can be contained but researchers agree, the individual practices at each fish farm can vary and some operations are better for the environment than others. So what can we do to protect the health of our ocean and our population as well as to ensure the continued livelihood of thousands of people?

## Enter Seafood Watch and Sustainable Seafood

“To empower **consumers** and businesses to make choices for healthy oceans,” is the mission of Monterey Bay Aquarium’s Seafood Watch program. Awareness, knowledge, and action are the cornerstones of this program. Designed to inform consumers of some of the issues the ocean faces AND provide those same consumers with a tangible way to take action, Seafood Watch makes it easier to make choices that are good for the ocean. How? The development of convenient national and regional guides that fit in a wallet and give sustainable seafood purchasing recommendations to consumers. Seafood Watch defines *sustainable seafood* as “being from sources, either fished or farmed, that can exist over the long-term without compromising species’ survival or the health of the surrounding **ecosystem**.”

The Seafood Watch program developed criteria to define sustainable seafood based on an ecosystem-based approach that favors conservation in the face of scientific uncertainty. Wild-caught seafood is defined as sustainable by Seafood Watch based on five criteria; 1.) species vulnerability to fishing pressure, 2.) status of wild **stocks**, 3.) nature and extent of discarded **bycatch**, 4.) effects of fishing practices on habitats and ecosystems, and 5.) effectiveness of management regime.

Based on the combination of those criteria, seafood is described as “Best Choice,” “Good Alternative,” or “Avoid” and listed on the guide. Consumers are then encouraged to follow the guide and check labels and ask questions when shopping or eating out. These questions include, “Where is the seafood from?” “Is it farmed or wild-caught?” “If it is wild-caught, how was it caught?” Consumers may refer to the Seafood Watch website at [www.seafoodwatch.org](http://www.seafoodwatch.org) for more information.

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**IF YOU PUT TOGETHER ALL OF THE WORLD’S FISHING BOATS AND GEAR, THE CATCH CAPACITY WOULD BE 2 1/2 TIMES WHAT IS NEEDED TO SUSTAINABLY FISH THE OCEANS.**

WWF, Fisheries for the Future

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## VOCABULARY

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**Aquaculture:** the controlled cultivation of aquatic animals and plants for human use

**Bycatch:** fish and other marine life caught incidentally along with targeted species

**Consumer:** a person that utilizes economic goods

**Ecosystem:** a community of plants, animals, and microorganisms linked by energy and nutrient flows

**Fishery:** the organized catch of a certain species of fish

**Stock:** the fish population of a particular species

## Procedure

### 1. INTRODUCE THE TOPIC OF SEAFOOD TO STUDENTS.

*Raise your hand if you like seafood. Why do or don't you like it? (texture, taste, etc.) What kinds of seafood dishes do you eat? (fish and chips, fish fillet sandwich, sushi) What are the names of the seafood used in those foods? (cod, halibut, salmon)*

### 2. DISCUSS AS A CLASS THE VARIOUS WAYS FISH ARE CAUGHT OR HARVESTED.

For additional background information, see "Gear Fact Cards" and "Aquaculture Fact Cards" at [http://www.montereybayaquarium.org/cr/cr\\_seafoodwatch/sfw\\_gear.asp](http://www.montereybayaquarium.org/cr/cr_seafoodwatch/sfw_gear.asp). (For wild-caught fish, people use longlines, hook-and-lines, purse seines, gill nets, dredging, harpooning, traps, pots, trawling, and/or dredging. For farmed fish, people use net pens, cages, raceways, ponds, and/or recirculating systems.)

### 3. INTRODUCE THE CONCEPT OF SUSTAINABILITY TO STUDENTS.

*Sustainability is "meeting the needs of the present without diminishing the ability of people, other species, or future generations to meet their own needs."* Discuss the importance of sustainability and ask students for examples. Then introduce the Seafood Watch program as an example. *It is a program that identifies which seafood to avoid and which to choose based on how environmentally friendly the fishing or farming methods are. The recommendations are updated twice per year based on the latest scientific information.* Show students the Seafood Watch pocket guides (download guides at [http://www.mbayaq.org/cr/cr\\_seafoodwatch/download.asp](http://www.mbayaq.org/cr/cr_seafoodwatch/download.asp)). Tell them they are going to be investigating what makes seafood sustainable. Depending on their prior knowledge, you may want to ask them for their ideas and list them on the board.

### 4. SELECT SEAFOOD FROM A MENU AND DISCUSS CRITERIA USED IN STUDENTS' CHOICES.

Pass out **Real Cost Café** menus and **Rate Your Plate** scorecards to students. Take students' "orders" off of the menu. Give each student a corresponding **Fish Fact** card. (Fish-n-chips is *Pacific Cod*; Fish Fillet Sandwich is *Mahi Mahi*; Catch-of-the-Day is *Chilean Sea Bass*; Tuna Salad is *Yellow Fin, Blue Fin, or Skipjack*.) Discuss the criteria students used to make their selection. (*cost, nutrition, craving, lack of options, health of that species*)

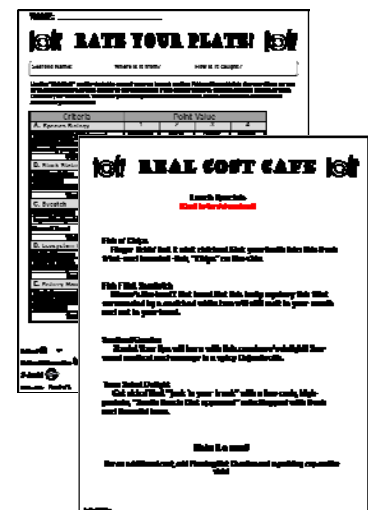
### 5. STUDENTS CALCULATE THE SUSTAINABILITY OF THEIR SEAFOOD ITEM.

Explain that they are going to score the sustainability of their seafood selection. Discuss the five main criteria (simplified on the **Rate Your Plate** score sheet). Use the additional explanation and vocabulary listed on the back of the scorecard to guide your discussion. Have students follow the directions on the scorecard to calculate their seafood sustainability score. (Use the **Rate Your Plate** answer key to make sure students are calculating correctly.)

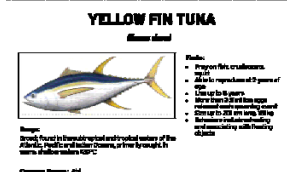
### 6. IN SMALL GROUPS, STUDENTS ANALYZE THEIR SUSTAINABILITY SCORES AND ANSWER DISCUSSION QUESTIONS.

Divide students into small groups based on fish species. Pass out Seafood Watch pocket guides and have them answer the discussion questions on the back of the **Real Cost Café** menu.

## STUDENT PAGES



The image shows two student pages. The top page is a 'Rate Your Plate' scorecard with a header 'Rate Your Plate' and a pencil icon. It includes fields for 'Last Name', 'First Name', and 'Date'. Below is a table with columns for 'Criteria' and 'Point Value'. The bottom page is a 'Real Cost Café' menu with a header 'Real Cost Café' and a pencil icon. It features a 'Search Menu' button and several 'Fish of the Day' items with descriptions and prices.



## TEACHER TIP

To add more realism (and fun!), bring in some table cloths and place settings to transform the classroom into a restaurant. Tape photographs of seafood from magazines or the internet on paper plates. Then tape **Fish Fact** cards to bottom of plates. These become students' "orders."

## 7. AS A CLASS, DISCUSS THE CHALLENGES AND BENEFITS OF MAKING SUSTAINABLE SEAFOOD CHOICES.

Use the discussion questions as a guide. You may choose to have each group defend or justify their seafood selection to the rest of the class. What are some of the challenges to making sustainable seafood choices? What about benefits? Besides seafood, what are other things students may purchase that have an impact on the environment? (*clothes, food, electronic items like phones and video games*) Are there more sustainable choices they could be making? If so, how? (*reducing the amount they buy, buying second hand items, reading labels more carefully, thinking about where an item comes from*)

### Extensions

- Have students choose their favorite fish or other kind of seafood and research and develop a Fish Fact card. What is its sustainability score?
- Have students choose another kind of meal (like a pizza or a cheeseburger) and track the source of its ingredients. What are some sustainability criteria that could be developed?

### Resources

#### Activities

"Empty Oceans." NOAA and National Marine Sanctuaries.  
[sanctuaries.noaa.gov/education](http://sanctuaries.noaa.gov/education)

"Fishing for the Future." Facingthefuture.org  
[www.facingthefuture.org/Curriculum/DownloadFreeCurriculum](http://www.facingthefuture.org/Curriculum/DownloadFreeCurriculum)

"Go Green Shopping." Sea Studios.  
[wwwtc.pbs.org/strangedays/educators/pdf/GoGreenShoppingActivity&Worksheet.pdf](http://wwwtc.pbs.org/strangedays/educators/pdf/GoGreenShoppingActivity&Worksheet.pdf)

#### Websites

*Seafood Watch Program.* [www.seafoodwatch.org](http://www.seafoodwatch.org)

Read detailed reports for each fish species and receive more information on issues like overfishing and unsafe fish farming practices.

*Sustainable Table.* [www.sustainabletable.org](http://www.sustainabletable.org)

Educate yourself about other sustainable food choices and receive many resources to use with your students.

*Be, Live, Buy Different—Make a Difference Campaign.* [www.ibuydifferent.org](http://www.ibuydifferent.org)

Enjoy this World Wildlife Fund and Center for a New American Dream website which is designed by high school students for high school students. It's focus is on making wise consumer choices. The site offers interactive quizzes, slideshows, and fun, student-friendly information.



### CONSERVATION TIPS

- Reduce printing costs by having students work in groups.
- Write the **Real Cost Café** menu choices and discussion questions on the board instead of printing menu out.
- Have students practice using the questions Seafood Watch suggest people use when eating out or shopping.

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**A PACIFIC ROCKFISH CAUGHT IN 2001 WAS 205 YEARS OLD—BORN WHEN WASHINGTON WAS STILL PRESIDENT! SUCH SLOW-GROWING FISHES ARE VERY VULNERABLE TO OVERFISHING.**

Seafood Watch website

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## References

Myers, R. A., Worm, Boris. (2003). Rapid worldwide depletion of predatory fish communities *Nature*, v.423, May 15 2003.

Naylor, R. et al. (2000). Effects of aquaculture on World Fish Supply. *Nature* 405, 1017-1024. June 29 2000.

Worm, B. et al. (2006). Impacts of Biodiversity Loss on Ocean Ecosystem Services. *Science* 314 (5800), 787.

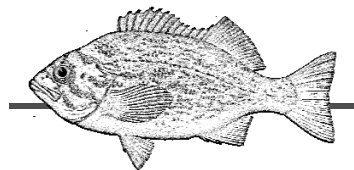
## Standards

### California Science Standards

Grades 9-12: Biology/Life Sciences 6a, b, c, d; 8b

Earth Sciences 5d

Investigation & Experimentation 1c, d, g, l, m



**IT IS IMPORTANT TO  
REALIZE THAT, WHILE  
FISHERIES AROUND THE  
WORLD ARE IN TROUBLE,  
IT'S NOT TOO LATE TO  
TURN THE TIDE.**

Julie Packard, Executive  
Director of Monterey Bay  
Aquarium



## Rate Your Plate Answer Key

Best Choices	
<p><b>Pacific cod (Alaska longline)</b></p> <p>Pacific Cod is considered “Best Choice” when the method of fishing is longlining. If Pacific Cod is caught by trawling then it drops to “Good Alternative” because there is more bycatch and a greater ecosystem impact. Atlantic Cod is rated as “Avoid.” It is a different species than Pacific Cod and it has been overfished; estimates are that only 10% of the original population remains. Plus, the main method of fishing Atlantic Cod is trawling so there is a high amount of bycatch and great ecosystem impact.</p>	<p><b>Total Score: 1</b></p> <p><b>Species Biology.</b> Resilient. 1  <b>Stock Status.</b> Healthy. 2  <b>Bycatch.</b> Low. 1  <b>Ecosystem Impact.</b> Low. 1  <b>Management.</b> Highly effective. 1</p>
<p><b>Skipjack tuna</b></p> <p>Skipjack tuna caught with a pole is rated “Best.” It has high fecundity and is resilient to fishing pressure. Unwanted species caught with a pole can often be released so Skipjack caught with this method has low bycatch impact.</p>	<p><b>Total Score: 1</b></p> <p><b>Species Biology.</b> Resilient. 1  <b>Stock Status.</b> Healthy. 1  <b>Bycatch.</b> Low. 1  <b>Ecosystem Impact.</b> Benign. 1  <b>Management.</b> Moderately effective. 2</p>
Good Alternatives	
<p><b>Mahi mahi/Dolphinfish</b></p> <p>Mahi Mahi is the Hawaiian name for Dolphinfish. Dolphinfish is considered “Good Alternative” when the method of fishing is longlining and it is caught in the U.S. That’s because management in the U.S. regulates the amount of bycatch. If it is caught with a pole and/or trolling in the U.S. it moves up to “Best Choice.” However, if it is caught outside of the U.S. with longlining, it is rated “Avoid” because there are no international laws to regulate the amount of bycatch caught with longlining.</p>	<p><b>Total Score: 2</b></p> <p><b>Species Biology.</b> Resilient. 1  <b>Stock Status.</b> Moderate. 2  <b>Bycatch.</b> Moderate. 2  <b>Ecosystem Impact.</b> Low. 1  <b>Management.</b> Moderately effective. 2</p>
<p><b>Yellowfin tuna (troll/pole)</b></p> <p>Yellowfin tuna caught with a pole is rated as “Good Alternative.” Yellowfin is not “Best” because it is being overfished in many parts of the world. Yellowfin caught with longlines or purse seines is rated “Avoid” due to rampant overfishing and high amounts of bycatch.</p>	<p><b>Total Score: 2</b></p> <p><b>Species Biology.</b> Resilient. 1  <b>Stock Status.</b> Moderate. 2  <b>Bycatch.</b> Low. 1  <b>Ecosystem Impact.</b> Benign. 1  <b>Management.</b> Moderately effective. 2</p>

## Rate Your Plate Answer Key (continued)

Avoid	
<p><b>Chilean sea bass</b></p> <p>Almost all Chilean sea bass is rated "Avoid." Only one fishery has been certified as using sustainable methods. Overfishing has been occurring since the early 90s at a fast rate. Sea bass is a slow-growing, late-breeding fish so it's very vulnerable . Bycatch is critical due to endangered sea birds like the wandering and grey-headed albatrosses diving for baited hooks and drowning. Management is critical due to the occurrence of "piracy" and illegal fishing. Most Chilean sea bass served in U.S. restaurants is caught illegally.</p>	<p><b>Total Score: 3</b></p> <p><b>Species Biology.</b> Vulnerable. 2</p> <p><b>Stock Status.</b> Poor. 3</p> <p><b>Bycatch.</b> CRITICAL. 4</p> <p><b>Ecosystem Impact.</b> High. 3</p> <p><b>Management.</b> CRITICAL. 4</p>
<p><b>Bluefin tuna</b></p> <p>Bluefin tuna is rated "Avoid." It is of enormous value to the international sushi market and is subject to heavy and unrelenting fishing pressure. Bluefin tuna can sell for over one hundred thousand dollars each. The Bluefin population has declined by nearly 90% since the 1970s. That is why stock status is critical. Bycatch is also critical due to high volumes of endangered and threatened species caught by purse seines.</p>	<p><b>Total Score: 3</b></p> <p><b>Species Biology.</b> Neutral. 2</p> <p><b>Stock Status.</b> CRITICAL. 4</p> <p><b>Bycatch.</b> CRITICAL. 4</p> <p><b>Ecosystem Impact.</b> Moderate. 2</p> <p><b>Management.</b> Ineffective. 3</p>

Name: \_\_\_\_\_



# RATE YOUR PLATE!



**Seafood Name:** \_\_\_\_\_

**Where is it from?** \_\_\_\_\_

**How is it caught?** \_\_\_\_\_

Use the "Fish Fact" card to circle the correct answers in each section. Add section subtotals down and then across. Write the total score of each section in box on the right. Place section totals (A-E) in the boxes at bottom of page. Calculate your final score. *Round your scores up or down to the nearest whole number!*

Criteria	Point Value				
<b>A. Species Biology</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Sexual Maturity Age (in years)	Under Five	5 to 10	Over 10	Critical	
Maximum Age (in years)	Under 11	11 to 30	Over 30	Critical	
Fecundity (# eggs or offspring)	Over 100	10 to 100	Under 10	Critical	"A" Total
<b>Section A Subtotals</b>					= ___ ÷ 3 =
<b>B. Stock Status</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Wild Population	Healthy	Moderate	Not Healthy	Critical	
Overfishing	Not Likely	Likely	Occurring	Critical	
Natural Distribution Status	Broad	Limited	Narrow	Critical	"B" Total
<b>Section B Subtotals</b>					= ___ ÷ 3 =
<b>C. Bycatch</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Overall Quantity	Little	Some	High	Critical	
Impact On Bycatch Population	Little	Some	High	Critical	
Current Trend	Decreasing	Stable	Increasing	Critical	"C" Total
<b>Section C Subtotals</b>					= ___ ÷ 3 =
<b>D. Ecosystem Impact</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Habitat Damage	Minimal	Moderate	Extensive	Critical	
Scale Of Impact	Minimal	Moderate	Extensive	Critical	
Food Web Impact	Minimal	Moderate	Extensive	Critical	"D" Total
<b>Section D Subtotals</b>					= ___ ÷ 3 =
<b>E. Fishery Management</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
Stock Assessment	Regular	Some	None	Critical	
Bycatch Monitoring	Regular	Some	None	Critical	
Enforcement	Regular	Some	None	Critical	"E" Total
<b>Section E Subtotals</b>					= ___ ÷ 3 =

1 = Best 😊

2 = Good Alternative 👍

3 = Avoid 🚫🐟

**A**   **B**   **C**   **D**   **E**

+  +  +  +  = \_\_\_\_\_ ÷ 5 =

The lower your score,  
the lower the hidden cost to the environment  
and the more sustainable your seafood!

**Your Scorecard Total**

**A. Species Biology.** The life history characteristics of a species determine its vulnerability to fishing pressure.

- **Sexual Maturity Age:** *How old is a fish when it can reproduce?* The younger it is when it can reproduce, the more fish it will produce in its lifetime making the species less vulnerable to fishing pressure.
- **Maximum Age:** *How long can it live?* The longer it lives, the slower growing it is and the more vulnerable it is to fishing pressure.
- **Fecundity:** *How many young can a female produce in her lifetime?* The more young a female produces, the more abundant the population will be and the less vulnerable it is to fishing pressure.

**B. Stock Status.** The abundance, health, and diversity within a species determine its vulnerability to fishing pressure.

- **Wild Population:** *How abundant is the population?* The more fish there are, the more protected the population is from fishing pressure.
- **Overfishing:** *Are individuals being caught faster than they can reproduce?* If fish are reproducing slower than they are being caught, the population is more impacted by fishing pressure.
- **Natural Distribution:** *What is the span of age, size, and sex within the population?* If it is a broad span, then the population will be less impacted by fishing than if it is narrow.

**C. Bycatch.** The amount and type of unwanted marine life accidentally caught while fishing for a species determines the sustainability of the fishery.

- **Overall Quantity:** *How much additional, unwanted marine life is caught as result of fishing method?* The less there is, the more sustainable the fishery.
- **Impact on Bycatch Population:** *How are the bycatch populations being effected by fishing?* The less the effect, the more sustainable the fishery.
- **Current Trend:** *Is the amount and kind of bycatch decreasing, staying stable, or increasing?* If it is decreasing, the more sustainable the fishery.

**D. Ecosystem Impact.** The impact of the method of fishing on marine habitat and food webs determines the sustainability of the fishery.

- **Habitat Damage:** *How much does the fishing method(s) hurt marine life habitat?* The less damage it causes, the more sustainable the fishery.
- **Scale of Impact:** *What is the size of the area impacted?* If it is minimal in size, the more sustainable the fishery.
- **Food Web Impact:** *How much is the energy transfer within the ecosystem affected?* The more minimal the impact, the more sustainable the fishery.

**E. Management of Fishery.** The effectiveness of the management of the fishery determines the sustainability of the fishery.

- **Stock Assessment:** *Is there some evaluation of population?* The more there is, the more sustainable the fishery.
- **Bycatch Monitoring:** *Is some unwanted catch noted?* The more there is, the more sustainable the fishery.
- **Enforcement:** *Are there laws and regulations in effect?* The more there is, the more sustainable the fishery.

#### Be Seafood Smart

##### Words to know...

**Fishery:** the organized catch of a certain species of fish (ie. Monterey Bay squid fishery refers to all squid caught commercially in Monterey Bay)

**Stock:** a subpopulation of a species of fish in a particular area

**Sustainable Seafood:** seafood from sources, either fished or farmed, that can exist over the long-term without compromising species' survival or the health of the surrounding ecosystem



# REAL COST CAFE



## Lunch Specials (Cost to be determined)

### Fish n' Chips \$7.95

Finger lickin' but it ain't chicken! Sink your teeth into this fresh fried- and breaded- fish, "chips" on the side.

### Fish Fillet Sandwich \$5.00

Where's the beef? Not here! This tasty mystery fish fillet in a whole wheat bun will still melt in your mouth and not in your hand.

### Catch-of-the-Day \$11.95

Fresh from the boat! You will enjoy this seasonal selection, grilled and served with steamed vegetables.

### Tuna Salad Delight \$6.95

Get rid of that "junk in your trunk" with a low-carb, high-protein, "South Beach Diet approved" salad topped with fresh and flavorful tuna.

### Make it a meal!

For an additional cost, add Flaming Hot Cheetos and a pudding cup on the side!

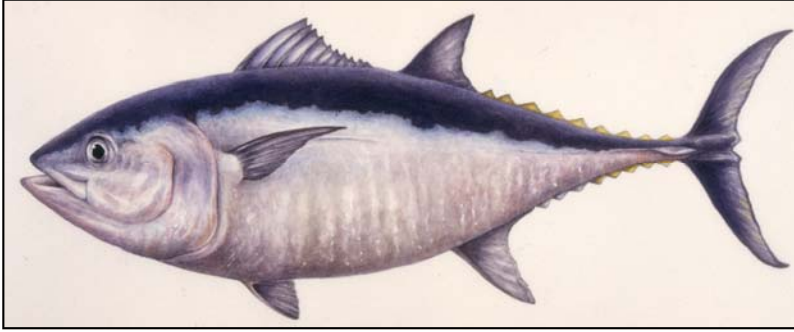
Name: \_\_\_\_\_



1. How did your sustainability score compare to the recommendations on the Seafood Watch pocket guide? If there were differences, what are some possible explanations?
2. Defend or justify your menu choice. Now that you know the sustainability score of your seafood item, would you have made a different choice? What changes in criteria could result in a more sustainable score?
3. Look at the Seafood Watch pocket guide. Is there any seafood listed that has multiple recommendations based on geography or method of fishing? If so, describe and explain why.
4. Based on what you've learned, explain how Seafood Watch recommendations may or may not affect the choices you and your family make when buying and eating seafood.
5. Use the Seafood Watch pocket guide to identify the three questions you can ask to make a more sustainable seafood selection. List them below. What could you do if a restaurant or store doesn't know the answers to those questions?

# BLUEFIN TUNA

*(Thunnus maccoyii, Thunnus thynnus, Thunnus orientalis)*



## Range:

Worldwide; Pacific Ocean, Southern Ocean, Atlantic Ocean

**Common Names:** Bluefin, Horse mackerel, Giant tuna, Maguro

## Facts:

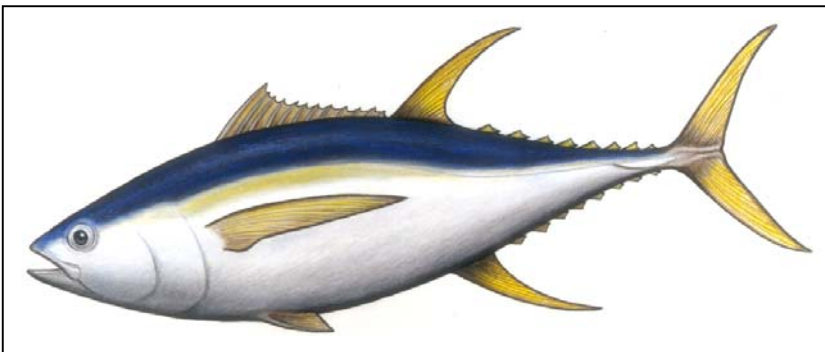
- Able to reproduce at 5 years of age
- Live up to 30 years
- Size up to 2 meters long and 500 kg
- Releases more than 10 million eggs during lifetime
- Super-efficient muscles and hydrodynamic bodies enable them to cruise through the water in bursts of up to 50 mph
- Behaviors include specific spawning grounds

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# YELLOW FIN TUNA

*(Thunnus obesus)*



## Range:

Broad; found in the subtropical and tropical waters of the Atlantic, Pacific and Indian Oceans, primarily caught in warm, shallow waters >20°C

**Common Names:** Ahi

## Facts:

- Prey on fish, crustaceans, squid
- Able to reproduce at 2 years of age
- Live up to 8 years
- More than 2.5 million eggs released each spawning event
- Size up to 201 cm long, 181 kg
- Behaviors include schooling and associating with floating objects

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# Fisheries Information

## *U.S. and International, Wild-caught*

### **Stock status:**

Not healthy wild population. Overfishing is occurring. Narrow natural distribution.

### **Bycatch:**

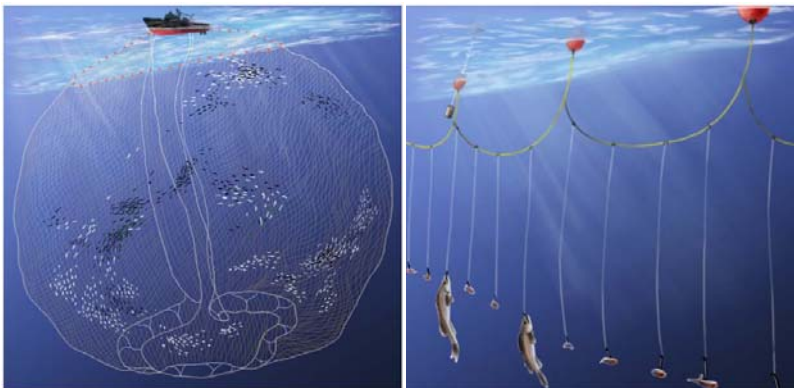
High amounts of bycatch caught with purse seining. High impact on bycatch population. Current trend is stable amounts of bycatch. Mark your score sheet "Critical" for quantity, impact and trend on bycatch.

### **Management:**

Multi-agency that varies by ocean basin. Stock rarely assessed. Bycatch rarely monitored. There is rarely enforcement of existing regulations. Mark "Critical" for stock assessment, bycatch and enforcement because bluefin tuna migrate across oceans, making international management and enforcement of regulations difficult.

### **Fishing Method:**

Purse Seines (below left), Long lines (below right)



### **Ecosystem Impact:**

Minimal habitat impact and scale of impact because fishing methods are pelagic and rarely come in contact with the ocean bottom to cause damage. Extensive food web impact due to large predator (tuna) removal from food web and removal of other species caught as bycatch.

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# Fisheries Information

## *U.S. and International, Wild-caught*

### **Stock status:**

Moderately healthy wild population. Overfishing occurring. Limited distribution.

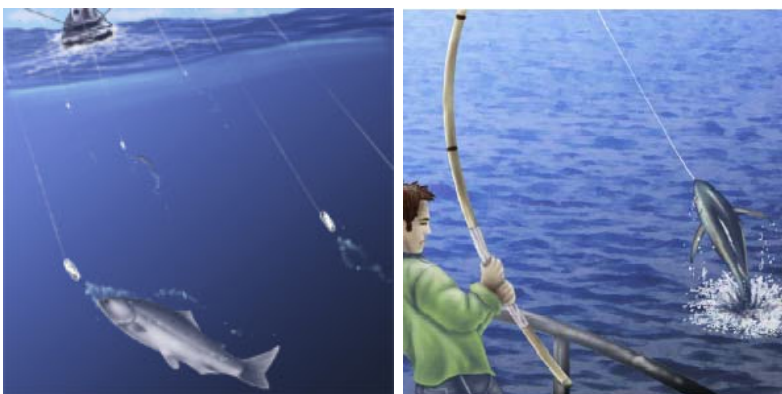
### **Overfishing:**

Little bycatch. Little impact on bycatch population. Current trend is decreasing amounts of bycatch.

### **Management:**

Multi-agency that varies by ocean basin. Stock sometimes assessed. Bycatch sometimes monitored. There is sometimes enforcement of existing regulations.

### **Fishing Method:** Troll (below left), Pole, also called hook-and-line (below right)



**Ecosystem Impact:** Minimal habitat effects and scale of impact, as fishing methods are either pelagic (midwater) or at the surface and do not come in contact with the seafloor. Moderate food web impact due to large predator (tuna) removal from the food web.

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# MAHI MAHI/DOLPHINFISH

*(Coryphaena hippurus)*



**Range:** Broad; found worldwide in tropical and subtropical waters (ocean temperatures above 20°C)

**Common Names:** Dorado, Common Dolphinfish, Wahoo

## Facts:

- Pelagic, schooling, top-level predators
- Size to 50-100 cm long; 28kg
- Able to reproduce at less than one year of age (average is 4-5 months)
- Live 2 to 5 years
- 85,000 to 1.5 million eggs released during spawning
- Behaviors include schooling and aggregating to floating objects

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# CHILEAN SEABASS

*(Dissostichus eleginoides, Dissostichus mawsoni)*



**Range:** Limited; Patagonian Toothfish are found in the Southeast Pacific and Southwest Atlantic. Antarctic Toothfish are found farther south. The range of the two species overlaps between New Zealand and Antarctica.

**Common Names:** Patagonian Toothfish, Antarctic Toothfish

## Facts:

- Able to reproduce at 9- to 12-years of age
- Live up to 50 years
- Size to 238 cm long; up to 130 kg
- 50,000-500,00 eggs during lifetime
- Unusual adaptations include antifreeze chemical in blood and abundant lipids in the flesh (for buoyancy)
- Behaviors include seasonal migration, specific spawning times and areas (2,200- to 4,400- meter-deep water in June through September).

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# Fisheries Information

## *U.S. , Wild-caught*

### Stock status:

Moderately healthy wild population. Overfishing not likely occurring. Estimates show Atlantic population increasing, though little is known about the Pacific population. Unknown (limited) distribution.

### Bycatch:

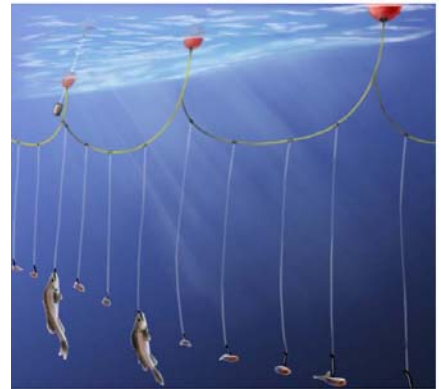
Some; includes sea turtles, swordfish, tunas and sharks. Some impact on marlin and leather-back turtle bycatch population. Current trend is decreasing amounts of bycatch.

### Management:

Multi-agency that varies by ocean basin. Stock sometimes assessed. Bycatch sometimes monitored. There is sometimes enforcement of existing regulations.

### Fishing Method:

Primarily Longline



Mathew Squillante 2002

### Ecosystem Impact:

Minimal habitat damage and scale of impact. Moderate food web impact possibly due to removal of such a large predator (Dolphinfish) from the ecosystem.

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# Fisheries Information

## *International, Wild-caught*

### Stock status:

Not healthy wild population. Overfishing is occurring. Narrow natural distribution.

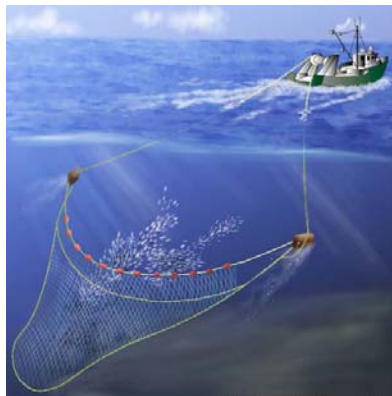
### Bycatch:

High amounts; includes endangered seabirds like albatrosses and petrels. High impact on the seabird population. Current trend is stable amounts of bycatch. Mark your score sheet "Critical" for quantity, impact, and trend on bycatch.

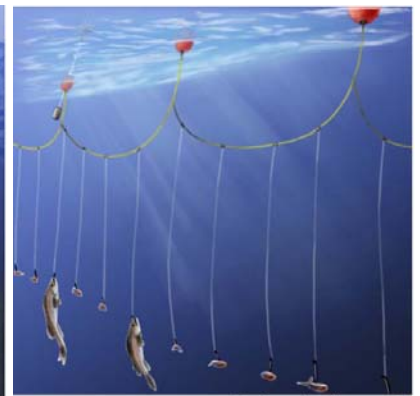
### Management:

- Currently monitored by the Conservation of Antarctic Marine Living Resources.
- Stocks rarely assessed.
- Bycatch rarely occurs.
- Enforcement rarely occurs.
- Due to high amounts of illegal and unreported fishing, mark "Critical" on your score sheet for stock assessment, bycatch monitoring and enforcement.

### Fishing Method: Bottom Trawl (below left), Traps, Bottom Longline (below right)



Mathew Squillante 2002



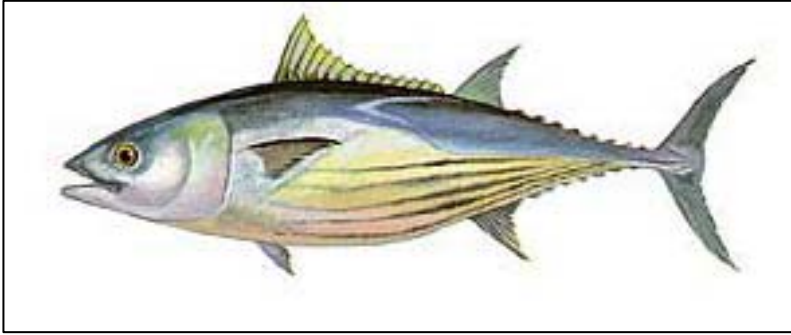
Mathew Squillante 2002

**Ecosystem Impact:** Extensive habitat damage; impacts are moderate from longlining but great from bottom trawls. Extensive scale of impact because of fragile ecosystem. Extensive food web impact from disruption of habitat and species loss.

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# SKIPJACK TUNA

*(Katsuwonus pelamis)*



## Range:

Worldwide; highly migratory species

**Common Names:** Aku, Canned Light Tuna, Arctic Bonito, Striped Tuna

## Facts:

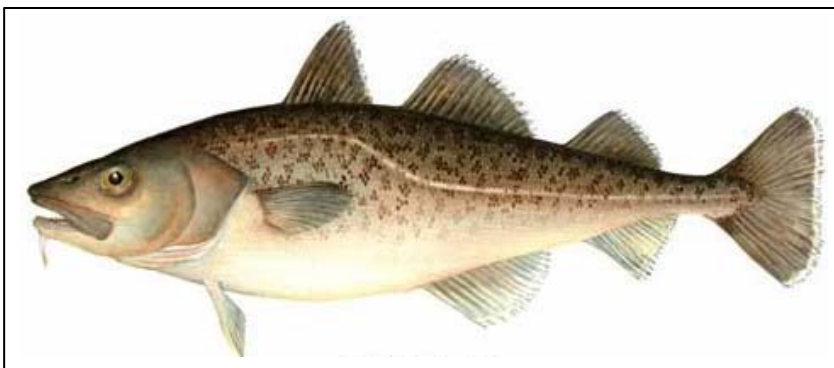
- Able to reproduce at 9 months of age
- Live up to 12 years
- Size up to 108 cm long, 34.5 kg
- 80,000 eggs released during spawning
- Behaviors include associating with floating objects and schooling

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# PACIFIC COD

*(Gadus macrocephalus)*



## Range:

Limited; continental shelf and slope in the Bering Sea and Gulf of Alaska (primarily north Pacific)

**Common Names:** Alaska cod, grey cod, true cod

## Facts:

- Prey item for many marine mammals
- Predator of pollock, shrimp, snow crab
- Able to reproduce at 5 years of age
- Live up to 25 years
- More than one million eggs released during spawning
- Behaviors include aggregating (grouping together) to spawn

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# Fisheries Information

## *U.S. and International, Wild-caught*

### **Stock status:**

Five stocks found in the eastern Pacific Ocean, western and central Pacific Ocean, west Atlantic, east Atlantic and Indian Ocean. Healthy wild population. Not overfished. Limited distribution.

### **Bycatch:**

Little bycatch. Little impact on bycatch population. Current trend is stable amounts of bycatch.

### **Management:**

Multi-agency that varies by ocean basin. Stock sometimes assessed. Bycatch sometimes monitored. Regular enforcement of existing regulations.

**Fishing Method:** Troll (below left), Pole, also called hook-and-line (below right)



Mathew Squillante 2002

**Ecosystem Impact:** Minimal habitat impact and scale of impact because fishing methods are either pelagic or at the surface and do not come into contact with the seafloor. Moderate food web impact due to large predator (tuna) removal from food web.

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# Fisheries Information

## *Alaska, Wild-caught*

### **Stock status:**

Moderately healthy. Not overfished. Unknown (limited) distribution.

### **Bycatch:**

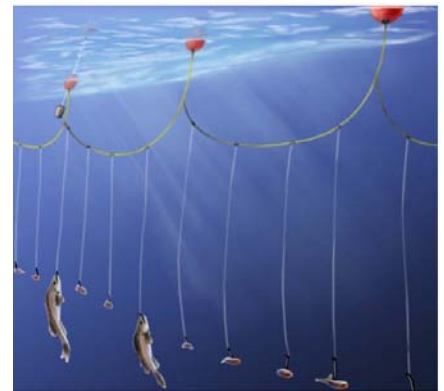
Little occurs with longlines; though some seabirds, including endangered albatross are caught. Overall, seabird population not impacted to bycatch. Current trend is decreasing amounts of bycatch.

### **Management:**

- Managed by National Marine Fisheries Service and North Pacific Fishery Council.
- Stock regularly assessed to determine population size.
- Bycatch regularly monitored by required observers on fishing vessels.
- Regular enforcement of existing regulations.

### **Fishing Method:**

Bottom Longline



Mathew Squillante 2002

**Ecosystem Impact:** Moderate habitat damage through entanglement though contact with seafloor sometimes occurs. Minimal area is impacted. Minimal impact on the food web (Stellar sea lion population may be affected).

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