

June 3 – Threats to the Oceans

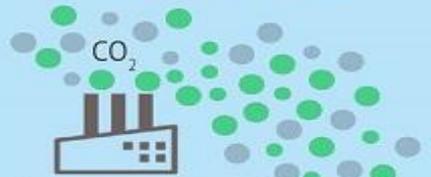
- Acidification
- Pollution
- Overfishing
- Algae Blooms
- Invasive Species



NOAA (National Oceanographic and Atmospheric Administration) Ships and Buoys Collect Data on Acidification and other Threats to the Oceans (NOAA Photo)

ACIDIFICATION IN OUR OCEAN

OCEAN ACIDIFICATION: Our ocean absorbs excess CO_2 when we burn fossil fuels to power cars and create electricity. This excess CO_2 increases acidity in our ocean on a global scale.



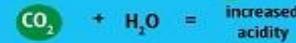
CO_2 is produced when using electricity, driving cars, and other industrial activities.

We, as humans, are deeply connected to our ocean whether we realize it or not. Our ocean regulates climate like the heart regulates blood flow in our bodies. Humidity, rain, and temperature are all controlled by our ocean. Burning fossil fuels adds excess heat and carbon dioxide that disrupt this system and make it harder to maintain a stable climate.

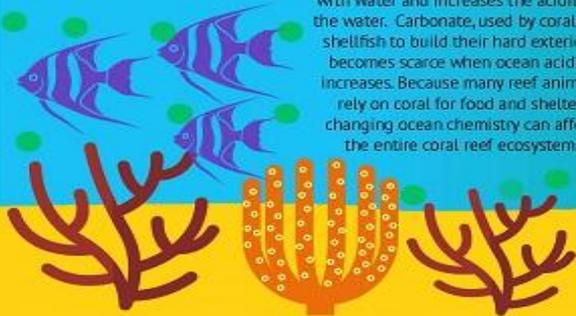
COASTAL ACIDIFICATION: Nutrients entering the water from land exacerbates acidification in near shore waters.



Concentrated nutrients from septic systems and fertilizer runoff into our ocean, carrying nitrogen and organic carbon that harm the marine ecosystem.



The ocean absorbs CO_2 , which mixes with water and increases the acidity of the water. Carbonate, used by coral and shellfish to build their hard exteriors, becomes scarce when ocean acidity increases. Because many reef animals rely on coral for food and shelter, changing ocean chemistry can affect the entire coral reef ecosystem.



Plankton populations thrive in high nutrient environments and can become so dense that they block light from sun-dependent organisms like coral. When this algal bloom dies, the plankton sink and are broken down. The decay process depletes oxygen and adds nutrients, exacerbating changes in ocean chemistry and creating a challenging environment for marine life.

Increased ocean acidity reduces fish size and populations. Some fish grow slower and cannot reproduce as well. Others have more difficulty avoiding predators.



<https://oceanacidification.noaa.gov/>

WHAT CAN WE DO TO HELP?



Cut back on watering your lawn or choose drought-tolerant landscaping to reduce runoff into the ocean.



Reduce the use of fertilizers with high nitrogen and phosphorus concentrations.



Eat a plant-rich diet and buy local produce to reduce transportation and production emissions.



Reduce energy use by choosing energy efficient appliances and learn about solar initiatives in your community.

Additional information on ocean acidification can be found at the Nature Conservancy presentation “Ocean Acidification” at <https://www.washingtonnature.org/oceanacidification> and the EPA article “Effects of Ocean and Coastal Acidification on Ecosystems” at <https://www.epa.gov/ocean-acidification/effects-ocean-and-coastal-acidification-ecosystems>

CORAL BLEACHING

Have you ever wondered how a coral becomes bleached?

HEALTHY CORAL

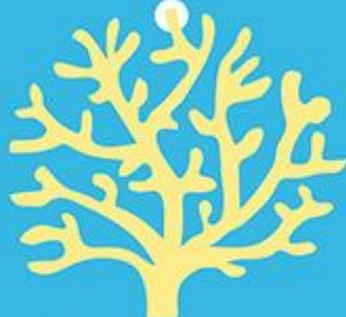
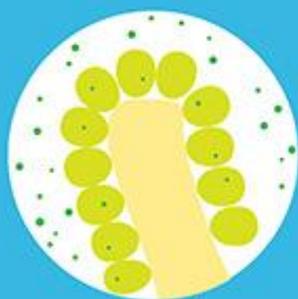
1 Coral and algae depend on each other to survive.



Corals have a symbiotic relationship with microscopic algae called zooxanthellae that live in their tissues. These algae are the coral's primary food source and give them their color.

STRESSED CORAL

2 If stressed, algae leaves the coral.



When the symbiotic relationship becomes stressed due to increased ocean temperature or pollution, the algae leave the coral's tissue.

BLEACHED CORAL

3 Coral is left bleached and vulnerable.



Without the algae, the coral loses its major source of food, turns white or very pale, and is more susceptible to disease.

WHAT CAUSES CORAL BLEACHING?



Change in ocean temperature

Increased ocean temperature caused by climate change is the leading cause of coral bleaching.



Runoff and pollution

Storm generated precipitation can rapidly dilute ocean water and runoff can carry pollutants — these can bleach near-shore corals.



Overexposure to sunlight

When temperatures are high, high solar irradiance contributes to bleaching in shallow-water corals.



Extreme low tides

Exposure to the air during extreme low tides can cause bleaching in shallow corals.



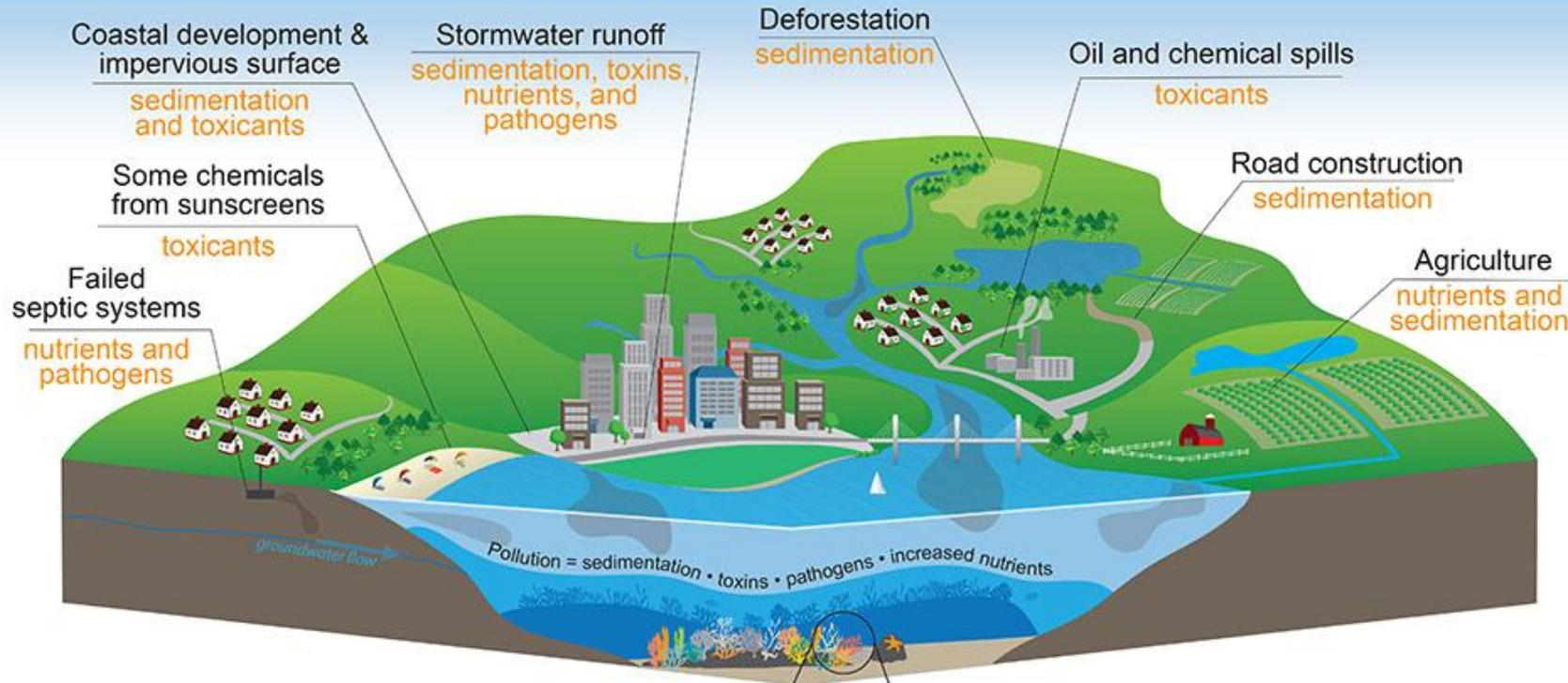
NOAA's Coral Reef Conservation Program
<http://coralreef.noaa.gov/>



Coral Bleaching between 2014 and 2015 in American Samoa – NOAA Photo XL Catlin Seaview Survey



THREATS TO CORAL REEFS LAND-BASED SOURCES OF POLLUTION

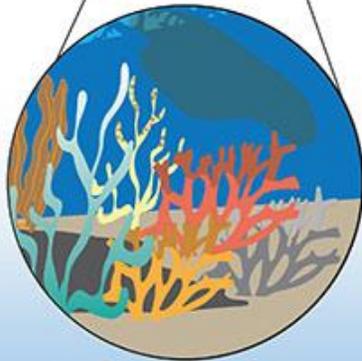


POLLUTION

sedimentation
toxicants
pathogens
increased nutrients



- causes disease and mortality
- disrupts ecological functions
- changes dynamics and feeding behaviors
- prevents coral growth and reproduction



As human population & development expands in coastal areas, the landscape is altered, increasing land-based sources of pollution & **THREATENING CORAL REEF HEALTH.**

HOW YOU CAN HELP

Apply fertilizers and pesticides sparingly.



Pick up after your pets.



Wash your car on your lawn.



Dispose of lawn clippings in a compost pile.



Harvest rooftop rain water through rain barrels or rain gardens.



DO NOT dump paint, oil, antifreeze, debris, or other household chemicals into street gutters or storm drains.



Clean up spilled brake fluid, oil, grease, and antifreeze.



Maintain proper septic system function with inspections and pumpouts every 3-5 years.



Seek shade between 10 a.m. and 2 p.m., use Ultraviolet Protection Factor (UPF) sunwear, and choose sunscreens with chemicals that don't harm marine life.



For more information, visit oceanservice.noaa.gov/sunscreen.

Overfishing

- “Globally, a total of almost 80% of the world's fisheries are fully-to over-exploited, depleted, or in a state of collapse.”
- “300,000 whales and dolphin are killed each year via by-catch”
- “90% of predatory fish are gone: tuna, sharks, swordfish, cod, halibut”
- Various national and international initiatives have been made to help maintain fish stocks
- Information on this page from “Overfishing Around the World”
<https://sites.google.com/a/cornell.edu/overfishing-around-the-world/home>



Commercial Trawl Vessel NOAA



Trawl NOAA



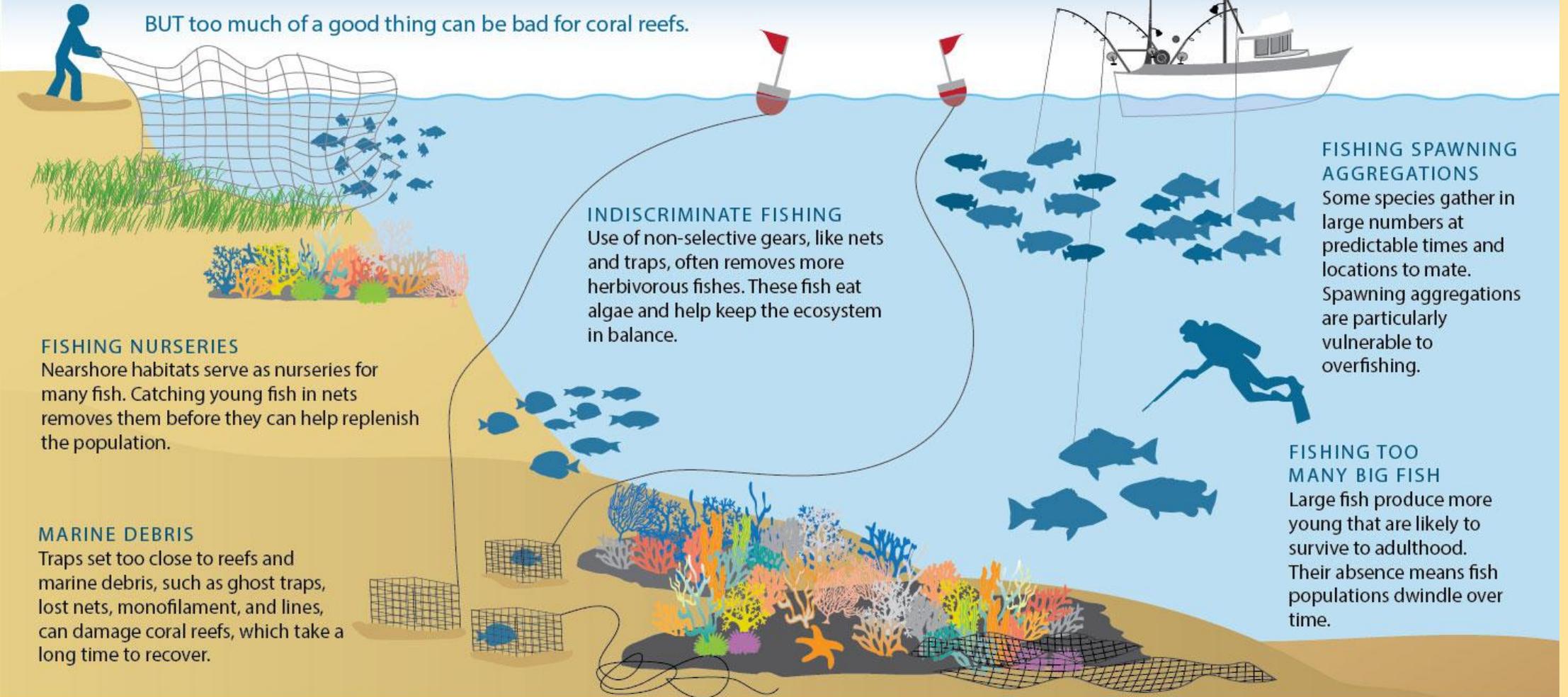
Fish Market NOAA



THREATS TO CORAL REEFS OVERFISHING

Coral reef fish are a significant food source for over a billion people worldwide. Many coastal and island communities depend on coral reef fisheries for their economic, social, and cultural benefits.

BUT too much of a good thing can be bad for coral reefs.



FISHING NURSERIES

Nearshore habitats serve as nurseries for many fish. Catching young fish in nets removes them before they can help replenish the population.

INDISCRIMINATE FISHING

Use of non-selective gears, like nets and traps, often removes more herbivorous fishes. These fish eat algae and help keep the ecosystem in balance.

FISHING SPAWNING AGGREGATIONS

Some species gather in large numbers at predictable times and locations to mate. Spawning aggregations are particularly vulnerable to overfishing.

FISHING TOO MANY BIG FISH

Large fish produce more young that are likely to survive to adulthood. Their absence means fish populations dwindle over time.

MARINE DEBRIS

Traps set too close to reefs and marine debris, such as ghost traps, lost nets, monofilament, and lines, can damage coral reefs, which take a long time to recover.

HOW YOU CAN HELP



Educate yourself on local fishing rules and regulations. Your state fishery agency or bait and tackle shop can help you learn more.



Make sustainable seafood choices. Learn more at www.FishWatch.com.



Only take what you need. Catch and release fish that you don't plan to eat.



Be a responsible aquarium owner. Know where your fish come from and DO NOT release unwanted fish into the wild.

The Problem with *Bycatch*

- Bycatch are marine species caught but not wanted during fishing operations; if fishing for tuna, you do not want dolphin; if fishing for shrimp, you do not want endangered sea turtles – but trawling, longline, and other intensive fishing techniques can be indiscriminate in what they catch
- “All in all, bycatch may account for up to 40% of the global catch, or 63 billion pounds of non-target species per year” (From *Planet Forward*, “Bycatch: the forgotten story of the food industry,” March 15, 2017, by Ariel Kagan)
- Estimates vary, but for every pound of shrimp caught, up to ten pounds of other marine life is thrown away
- Bycatch can affect fish stocks and protected marine mammals and sea turtles
- Various national and international initiatives have been made to mitigate bycatch
 - Drawn from NOAA Fisheries “Understanding Bycatch” June 19, 2017
- For more on Bycatch, go to <https://www.fisheries.noaa.gov/insight/understanding-bycatch>



Bycatch from Commercial Shrimping NOAA



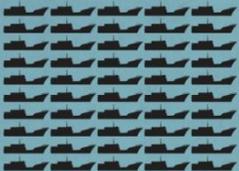
Entangled Whale NOAA

LOONGLINER IN OPERATION



LOONGLINE FISHING BOATS
Nobody knows exactly how many longline boats are out in the ocean but estimates indicate there are over 5000 longline vessels fishing for tuna and tuna like species in the world.

OVER 5000 LOONGLINE VESSELS



SIZE
Longline fishing boats can be up to 60m long, however, most are so-called small scale vessels of less than 24m.



Source: Greenpeace Out of Line: The failure of the global tuna longline fisheries

LOONGLINES + HOOKS up to 150 km long



up to 3000 hooks

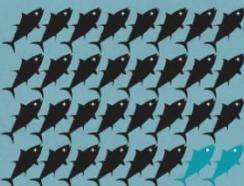
MARINE ANIMALS DYING
300,000 sea turtles and at least 160,000 seabirds and millions of sharks die annually in longline fisheries.

300,000 SEA TURTLES

160,000 SEA BIRDS

MILLIONS SHARKS

OVERFISHING



All target tuna species now either overfished, being overfished or depleted.

SHARK FINNING

Sharks often targeted for their high value fins make up as much 50% of catches in some longline fisheries.



UP TO **50%** OF CATCHES CAN BE SHARKS

PIRATE FISHING AND TRANSSHIPMENT
Many vessels transfer their catches at sea resulting in high amounts of unreported and illegal fishing.



MISTREATMENT OF CREW
Vessels can stay at sea for several years keeping their crew in a captive environment.

1 YEAR | 2 YEARS | 3 YEARS



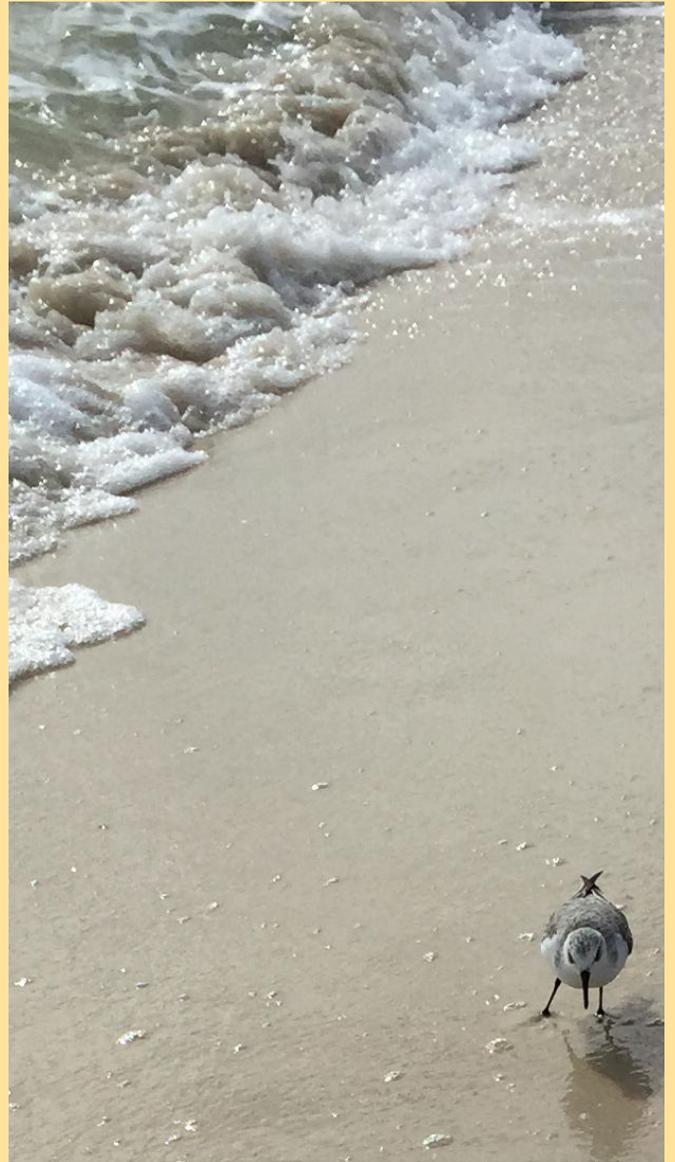
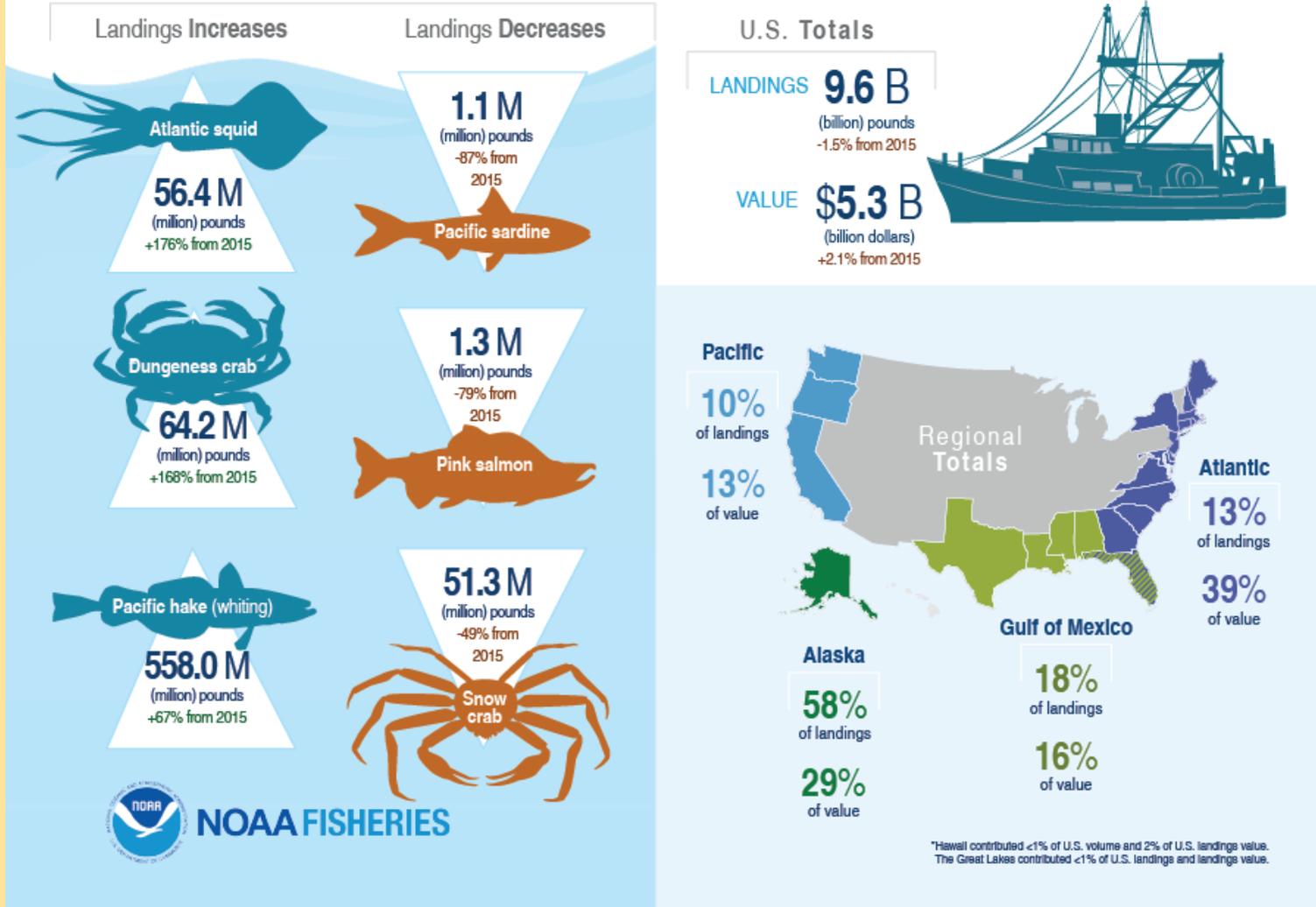
SOLUTIONS

- Reduce fishing capacity and enforce sustainable catch limits
- Ban all at-sea transshipments
- proper monitoring and 100% observer coverage

MITIGATE BY-CATCH BY:

- Not targeting sharks and banning shark finning
- Use circle hooks and other best practise mitigation methods

2016 U.S. Commercial Fisheries and the Seafood Industry Highlights

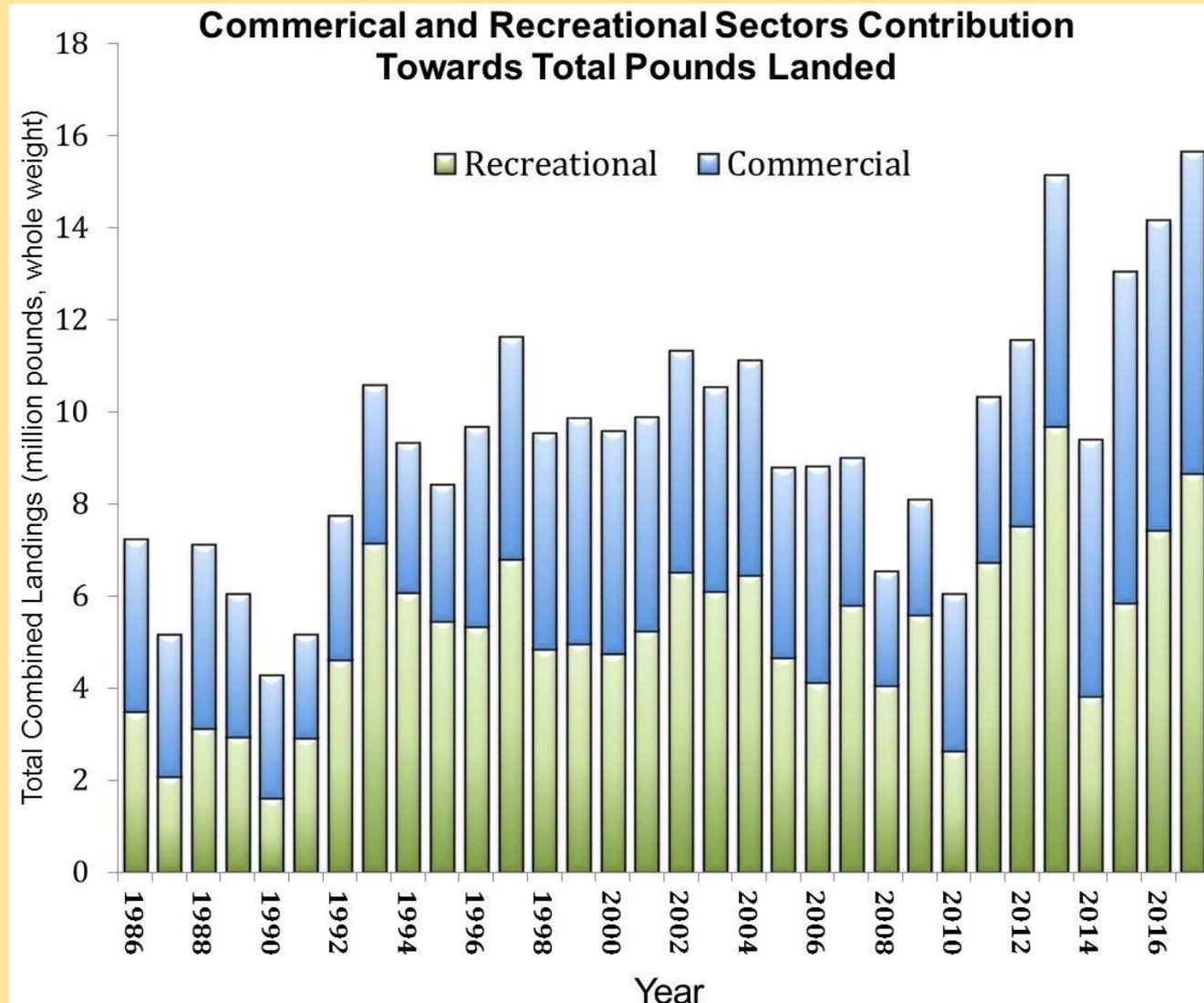


A Walk on the Beach
Courtesy Connie Walker

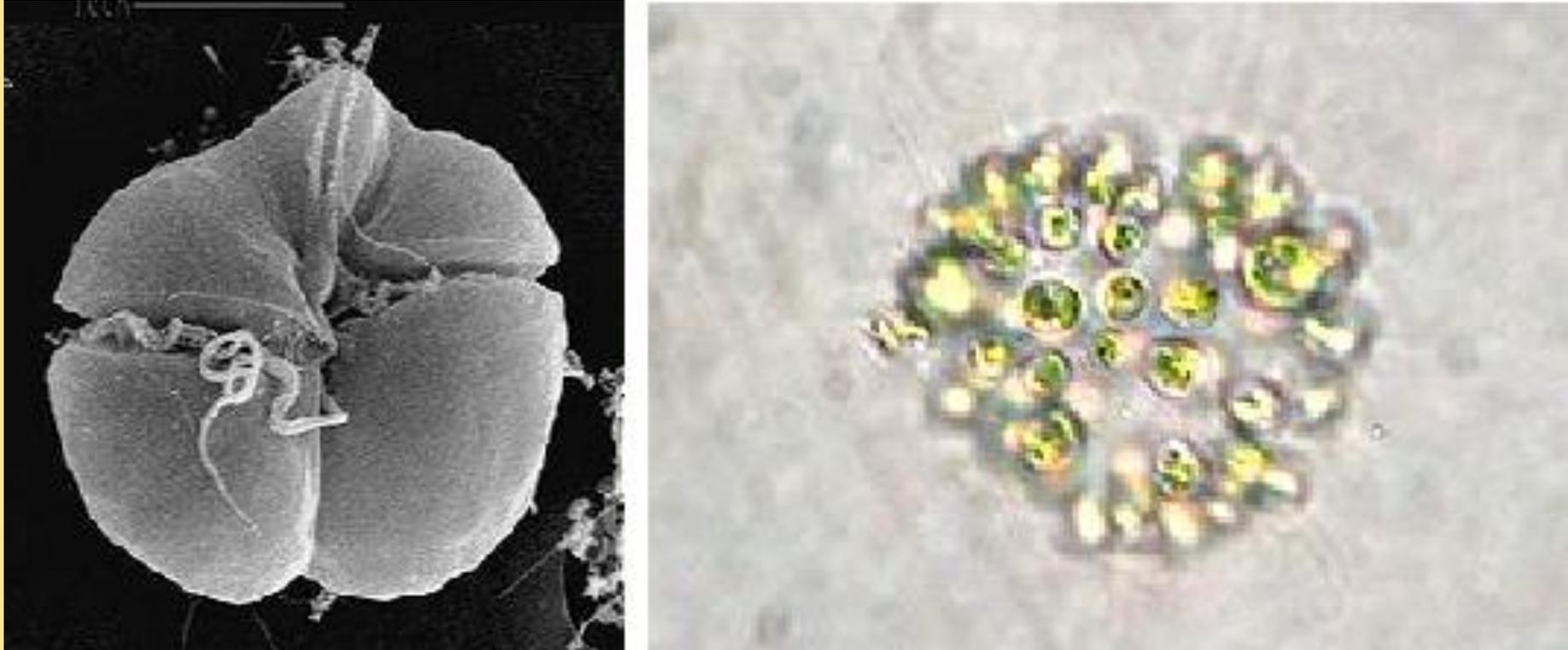
<https://www.fisheries.noaa.gov/feature-story/fisheries-united-states-2016>
for more on the US Commercial Fishing and Seafood Industry

Red Snapper Catch in the Gulf of Mexico

NOAA Fisheries Graphic Courtesy Fish and Wildlife Research Institute



Toxic Algae



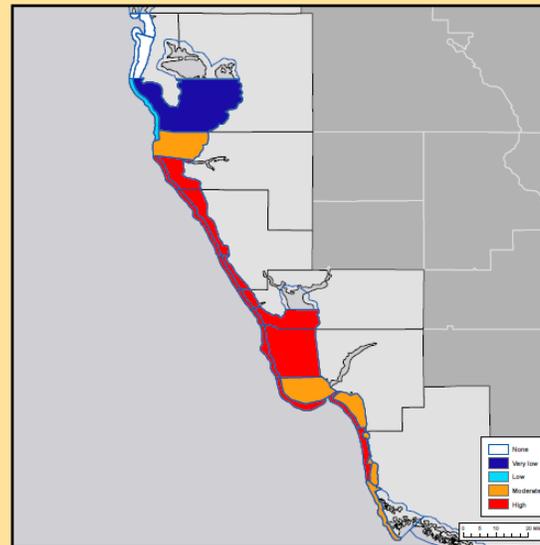
Left: *K. brevis*, the species that causes red tide and associated fish kills. Right: The dominant cyanobacteria (*Microcystis aeruginosa*) responsible for the blue-green algal bloom in Lake Okeechobee, 2018. From Krista Stump UF/IFAS Blog

Red Tide

- Red tide is caused by *karenia brevis*, a species of dinoflagellates – a type of plankton
- *Karenia brevis* produces “brevetoxin” that can affect the central nervous system of fish and other marine life, killing many; people can suffer respiratory and eye ailments from the airborne brevetoxin
- Florida red tide blooms often form 10-40 miles offshore in the Gulf of Mexico but can be driven toward land by wind, tide and current
- Scientists do not know what causes red tide blooms, though nutrient runoff from land may prolong bloom duration
 - Drawn from Maia McGuire UF/IFAS Blog
- More about Red Tide is available at <https://scijinks.gov/red-tide/>



Red Tide on Texas coast NOAA



In the map above, the highest level of potential respiratory irritation forecast is displayed as a layer for each day from 08-20-18 to 08-23-18. See next page for a table of the respiratory irritation forecasts.



Dead Fish from Toxic Algae off Sarasota, Florida NOAA National Centers for Coastal Ocean Science

NOAA's Southwest Florida “Red Tide” Respiratory Irritation Forecast for August 20, 2018 NOAA.

Blue-Green Algae

- Lake Okeechobee is prone to large algae blooms in warm sunny periods when heavy rainfall cause inflows of phosphorus and nitrogen rich water from its watershed
- Some, but not all, blue-green algae release toxins that can kill fish and wildlife
- *Microcystis aeruginosa* can produce the hepatotoxin (liver toxin) microcystin which can cause gastro-intestinal and possible liver problems in humans if ingested
- Some blue-green algae produce neurotoxins (nervous system toxins) that can cause respiratory system and eye irritation and dermatotoxins associated with skin irritation
 - *Drawn from Lisa Krimsky UF/IFAS blog*



NOAA National Centers for Coastal Ocean Science
M. Parsons FGCU

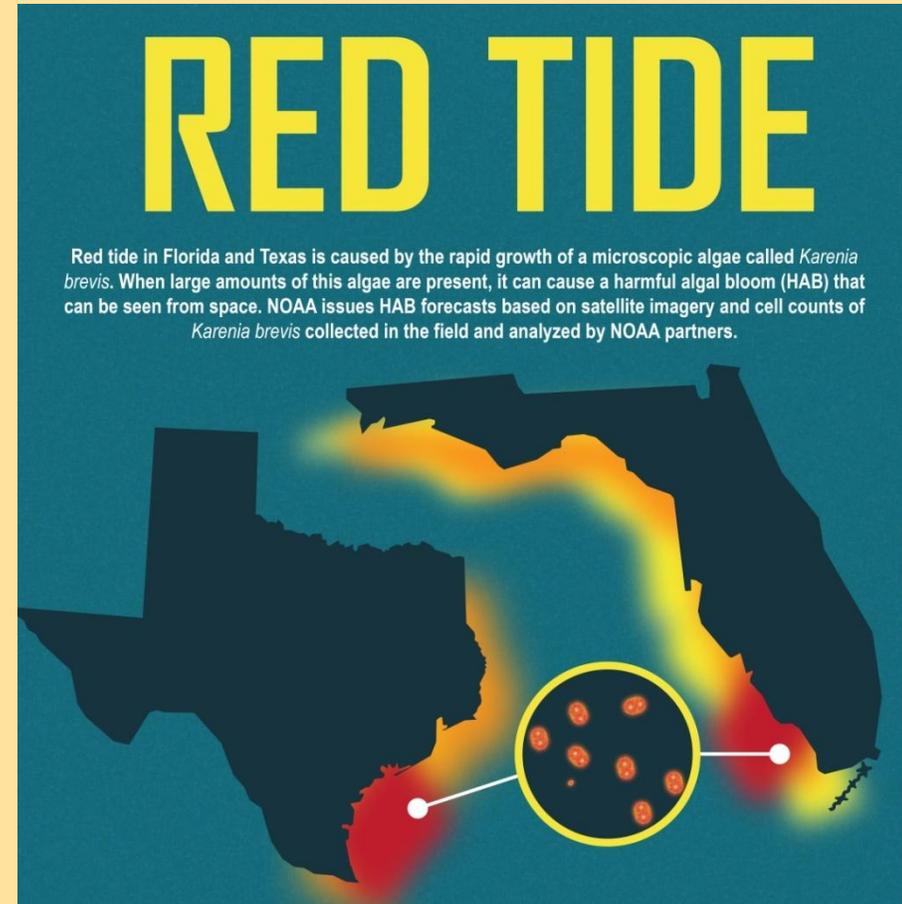
Toxic Algae

For more on toxic algae go to the Sea Grant online publication “State of Science for Toxic Algal Blooms in Florida” at

<https://chnep.wateratlas.usf.edu/upload/documents/SGR-136-HAB-Science-Aug2019.pdf>

and NOAA’s “Gulf of Mexico/Texas Harmful Algae Blooms” at

<https://oceanservice.noaa.gov/hazards/hab/gulf-mexico.html>



Some Invasive Species in Gulf Waters



Regal Demoiselle USGS-NAS



Asian Tiger Shrimp NOAA



Lionfish NOAA

- Regal Demoiselle are from the Indo-Pacific and were found off the Mexican coast in 2013; they were identified in Northern Gulf of Mexico waters in 2017, particularly near oil rigs, but their effect on local species is unknown (USGS)
- Asian Tiger Shrimp from the Indo-Pacific have been found in Gulf waters since 2002; their local effects are uncertain (USGS)
- Lionfish are also from the Indo-Pacific and are a popular aquarium fish, which may be how they arrived in Gulf waters in the early 1990s; they are voracious predators and have greatly multiplied; efforts to control their numbers with lionfish hunting tournaments and other means are ongoing



Killer Whale NOAA



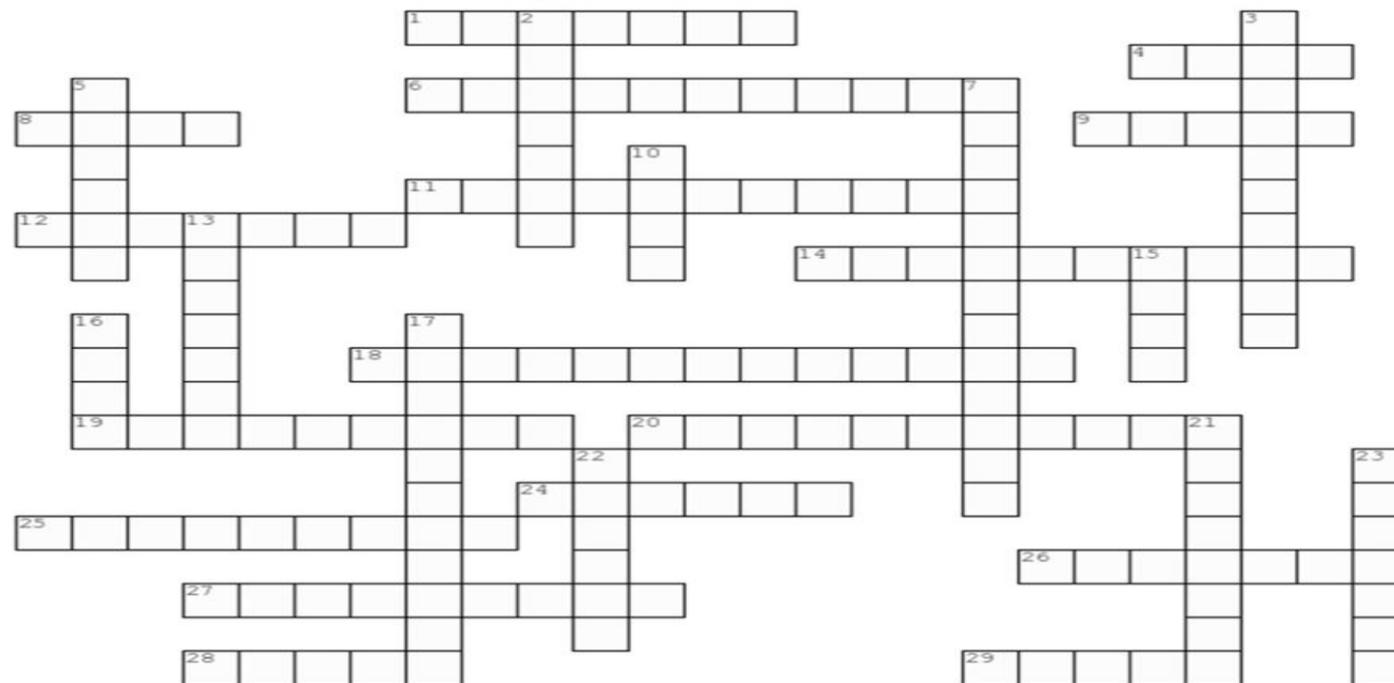
Red-Footed Booby and Flying Fish
Bernardo Alps NOAA



Rough Toothed Dolphin
Marie Hill NOAA

Sea Animals

Complete the crossword below



Across

1. Herbivorous sea mammal, related to the dugong
4. Bottom of a shoe that is a fish
6. Uses discarded shells for a home
8. Killer Whale
9. Smallest marine mammal
11. World's Largest Fish
12. Bottlenose _____
14. Largest living bivalve
18. Most venomous creatures in the ocean
19. Largest ray in the ocean
20. Gastropod with Naked Gills
24. Hawksbill _____
25. Nemo
26. A color changing mollusc
27. A shark that looks like carpet
28. Important food for other creatures
29. _____ watching in Hervey Bay

Down

2. Unicorns of the sea
3. The world's largest marine animal
5. Leafy Sea _____
7. Second largest fish in the ocean
10. Australian fur _____
13. Fairy _____
15. Whale baby
16. Tube _____
17. Used as money in the past
21. Can't run in the Melbourne Cup
22. Sea Cow
23. A large crustacean with a muscular tail and two large claws



NOAA FISHERIES

Habitat Conservation

Protect. Conserve. Restore.



NOAA works to protect and restore marine and coastal habitat to sustain fisheries, recover protected species, and maintain resilient coastal ecosystems and communities.



Benefits of Healthy Habitat



75%

of our nation's commercial fish catch comes from coastal and estuary habitat.

More than **180 million** people visit beaches and other coastal habitat every year, and coastal recreation and tourism generate \$8 to \$12 billion annually.



Coral reefs protect shorelines by reducing wave energy by

97%



In the United States in 2016, approximately 9.8 million saltwater anglers supported 472,020 jobs and generated nearly **\$68 billion** in sales impacts.



Our Work

Healthy habitat—like wetlands, rivers, oyster and coral reefs—support fish and wildlife, clean water, and recreation.



Habitat restoration supports an average of 15 jobs per **\$1 million** invested.

146,216

acres of habitat restored by NOAA since 1991.



\$625 million

in property damages were prevented by coastal wetlands during Hurricane Sandy.

