

# Conservation

## Classroom Resources

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“ Menhaden meal has been an ingredient in chicken, pig, and dairy feed since at least the nineteenth century. It’s now also a standard part of the diet on many fish farms, where it typically takes four pounds of forage fish to produce a pound of the salmon and other species we like to eat. ”

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## The Oiliest Catch

By Richard Conniff

Menhaden is a modest little fish so rich in oil that it’s sometimes called the soybean of the sea. But scooping them up to fuel the Omega-3 fish oil craze could pull the rug out from under the entire Atlantic coastal food chain.

### SUMMARY QUESTIONS

[worksheet available online](#)

1. What are some of the leading predatory species (fish, birds, and mammals) that rely on menhaden? (answer: From beginning of article - whales, tunnies, porpoises, osprey, and striped bass. From mid-article – Atlantic bluefish, humpback whales, and pelicans, bald eagles. From the end of the article - bluefish in Maine)
2. What does the term “forage fish” mean? What are some other species of forage fish besides menhaden? (answer: forage fish are prey for many other species, usually small in size and prolific in number. others include herring, sardines, and anchovies.)
3. What other ocean food web is suffering the same type of disruption as the menhaden food web? What additional factors are given as causes for the food-web



### BUILD YOUR OWN GLOSSARY

- ▶ [shifting baselines](#)
- ▶ [forage fish](#)

collapse besides the decline in forage fish? (answer: anchovies in Peru, additional factor = weather pattern changes)

4. Who buys the menhaden? For what products? Are there alternatives? (answer:  $\frac{3}{4}$  of the remaining Atlantic shoreline catch goes to Reedville's Omega Protein Corporation reduction plant. The fish oil goes in many products: supplement pills, an ingredient in livestock feed, fish-farm feed, Smart Balance buttery spread, salad dressings, cookies, and other omega-3 enriched foods. Since the fish get the omega-3 from the algae they eat, they don't produce it themselves, it's possible to bypass the fisheries and get the omega-3 from the algae – but as of now the technology makes the product much more expensive.)
5. Who is in charge of monitoring the menhaden population? What is the current method of predicting menhaden population numbers? (answer: the Atlantic States Marine Fisheries Commission ASMFC, a 15 state organization, and the National Marine Fisheries Service. The current method is a computer population model, which has been shown to be flawed).
6. What is the average egg-production rate per female fish? Given this number, what are the alternative explanations for shrinking population size other than overfishing? (answer: Mature menhaden female can produce 500,000 eggs annually. Alternative explanations include periodic shift in weather patterns offshore / climate change, habitat reduction, or habitat pollution.)

### DISCUSSION QUESTIONS

[worksheet available online](#)

1. According to historical accounts, what type of regulation is going on in the Atlantic marine ecosystem: top-down or bottom up control? Has this dynamic changed? What forces have changed it?
2. How are the life history stages of the menhaden being affected? (answer: Recruitment reduction of 117 trillion to 18.4 trillion eggs, and fry/juvenile survival also going bust.) What different forces are affecting the different stages?
3. What is the evidence that predators are being impacted by menhaden depletion? Could the reduction in menhaden numbers account for the deteriorating health of the predatory fish? What other explanations might there be? How could you disentangle which force was driving the predatory fish declines?
4. How might you argue from an economic point of view that forage fish catch should be limited?



5. What do you think of the local fisherman's arguments regarding his right to harvest fish? Where do private rights end and public rights begin?
6. How has the fish-oil health craze (in capsule or in foods) affected the industry? Describe a technological fix to this problem.
7. What is meant by "shifting baselines"? How does this concept apply (or not) in the case of the menhaden fishery? Can you think of an example of this in your everyday life? (hint: Sports? Shopping?)
8. What management goal was changed recently in menhaden management? (See the "More to the Story" box within the article online.) What activity will have to be changed to meet this goal? What stage of life history will this activity primarily influence: birth rate, recruitment, survival, mating success? Discuss the implications of this policy change.

### ADVANCED ACTIVITIES

**Further Reading:** "Little Fish, Big Impact," a report from the Lenfest Forage Fish Task Force, available at [lenfestocean.org](http://lenfestocean.org)

- 1. The Power of Citizen Science:** Find other examples of citizen science such as Price's observational data collection. Share stories of how untrained, yet keen observational skills of the average person can impact science.
- 2. Turning the Conservationist Coin:** Who in this story who currently works for the menhaden fishing industry might be put to work protecting it? What are their skills? How could those skills be put to use for the other side of the coin? Are those skills needed (in other words, do we need the type of data they could help collect)? Who would they work for? How much should they get paid? Draw up a business plan. Research other examples of this kind of flipping. (*Hint: poachers who become wildlife safari guides*)
- 3. Life-history Tables for Population Modeling:** What are life-history tables? What data do you need to build one? How do they work? What do they predict? Build life-history tables for menhaden based on numbers from the article and additional research. Play with the numbers to see what has the largest effect on population growth. Does an organism's natural history (age to maturity, clutch size, semelparous, etc) affect population growth – and which stage(s) should you protect to maximize population growth?
- 4. Success Stories in Fisheries:** The article mentions the recovery of striped bass, mackerel, blue crabs, and summer flounder ("as well as for the commercial fishermen who depend on them"). Research one of these success stories. Were these recoveries accomplished by reducing the catch alone, or were there other synergistic activities (e.g. pollution clean-up, translocation, genetic rescue)? What does a recovery plan involve? How do you deal with scientific unknowns in a recovery plan? What components would be in a recovery plan for menhaden? Find available data, design your own recovery plan for menhaden, and compare it to an existing recovery plan.