# Everett-Vehrs Conservation and Research Foundation

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Dear Members of the New England and Mid-Atlantic Fisheries Management Councils:

I am writing to recommend changes to current and proposed fishery closures that seek to protect sensitive areas from disturbance. As implemented and proposed, closures cause greater ecological damage overall and harm the economy and our food resources. Collectively, we need a balanced approach that both promotes fisheries production and protects habitat where necessary or beneficial.

The Magnuson-Stevens Act requires NMFS and the Councils to evaluate economic and social impacts, sustained participation of fishing communities, costs, efficiency, sector impacts, and the benefits and impacts of closures, while still meeting conservation requirements. Economic production, fishing-community impacts, food production, and practicable alternatives are primary, not secondary or optional, considerations. That is a strong statutory argument, especially against broad closures adopted without a rigorous comparison of ecological benefits, lost production, fishing-community impacts, and less restrictive alternatives.

Most of us involved in "fisheries" do so because we love nature and our work – and it pays the bills. Some of us think the natural order should not be changed by man, while others look to maximize long-term production for economic benefit. In this message, I acknowledge both points of view, but favor seeking the potential regional and national benefits that come from increased and sustained fisheries production. My concept is very much about farming the sea using carefully timed and controlled disturbance to maintain productive bottom habitat.

This message is 55 years in the making. In 1971, as I left my family's fishing business in Fairhaven, Massachusetts, to join the new NMFS, my father asked me to find out why quahog production increased a thousand-fold four years after the outer Fairhaven-New Bedford harbor reopened for winter fishing, following six decades of closure due to sewage pollution. In the first year, there were about ten littlenecks among the old "bulls" in the 30-bushel daily limit. By the fourth year, very valuable littlenecks (20X) were so abundant that all large quahogs were thrown back, and many more recruits for the following years were visible, as can be seen in the photos below. Each of us (three plus the boat) earned a year's pay every six days for a few hours' work.

It took me decades to learn the mechanisms for the observed production – starting with learning of increased North Sea worm/flounder production from bottom trawling. The final two pieces recently fell into place, explaining the difference between the 10 to 100-fold one-time increases seen in New England shell-fisheries from the 1938 and 1954 hurricanes and the steady1,000-fold increase from hydraulic dredging in Fairhaven.

**Ecological Rationale**

Fishery management traditionally treats seafloor disturbance as inherently damaging. The very opposite is more often true. Disturbance is key to production - whether corals, mollusks, fish, or their food. When a hydraulic dredge passes, clean shells, shell hash, buried coral, and stones come to the seafloor surface. Larvae of some mollusks, corals, polychaete worms, and others will attach to those shells, stones, and coral for several days. They stay (e.g., oysters, barnacles, corals) or detach (e.g., scallops, worms) or use the shells, stones and corals for temporary shelter while seeking a suitable habitat on the bottom into which they can burrow, and their siphon or mouth can reach above silt and detritus. Juvenile and adult surf clams and other deep-burrowing species can more easily burrow deeply, quickly escaping their predators. Exhaustion for the young comes after a few tries. Soon, baby cod descend, hiding among the shells to avoid predation from crabs and fish (mostly) while feeding on the new arrivals and others.

Without disturbance, the bottom becomes moribund within a year, but if attachment is required, as for oysters, mussels, and scallops (2 times), shell degradation begins in days. Fine sediments and organics build rapidly (fastest on the top), and oxygen declines. Except in very high-current areas, coarse, oxygenated substrate—sand, stones, and shell—becomes covered with fine, anoxic mud and biological growths. Settlement and survival of molluscan and polychaete larvae and young drop sharply, and young fish, lobsters, and others lose nursery habitat and prey.

Periodic disturbance, whether from major storms, bioturbation (e.g., by worms), or periodic fishing, rejuvenates the seabed. Worms of many species benefit, thriving on disturbance that resuspends fine sediments and exposes clean shell, coral, stones, gravel, and refuge spaces (required by mollusks, crustaceans, coral, and young cod). Periodic disturbance recharges the seabed with oxygen. Hydraulic dredging does it best.

This renewal supports robust communities, including fish, scallops, lobsters, and clams. Stable, clean, coarse substrate harbors more young cod and others. Strong recruitment requires disturbance. Areas with strong currents are helpful but not sufficient. Annual, but managed, disturbance is essential. For species needing attachment, fishing should just precede the need for clean surfaces.

Periodic disturbance can be ecologically productive in most habitats, at the right intensity, and at the right season. Hydraulic dredging loosens compacted sediment, removes or disperses accumulated fine material and organic debris, exposes clean shell and gravel, and creates a mosaic of disturbed and recovering patches. That kind of habitat mosaic can provide settlement surfaces, oxygenated sediment, prey production, and refuge for small benthic animals and demersal fish. These are not trivial benefits; they are part of how shallow, high-energy shelf systems remain productive. This is especially important for species whose early life stages depend on the transition from pelagic larvae to benthic habitat.

Young cod, haddock, scallops, clams, polychaete worms, and many other organisms do not need “undisturbed bottom.” They need suitable bottom: oxygenated sediment, clean shell or gravel, interstitial spaces, prey, and places to avoid predators. On Georges Bank and elsewhere in the region, structurally complex sand, gravel, cobble, shell, and boulder habitats are important for juvenile cod and haddock. Year-round absence of fishing gear does not improve those habitat functions. The opposite is true.

**Supporting Evidence**

Multiple empirical studies support these dynamics, including (full references at end):

- Lambert et al. (2014, 2015, 2017) documented that benthic community structure and productivity were maintained when dredging intensity remained below approximately three passes per season.
- Crawford (2003) showed that dredging in aquaculture areas reduced silt buildup and improved settlement substrate.
- Thrush & Dayton (2002) showed that periodic disturbance prevents habitat stagnation, maintains multiple successional stages, and promotes resilience.
- Hiddink, Rijnsdorp & Piet (2008) showed that prey production for flounders, mostly small polychaete worms, was lowest when the seabed was undisturbed, highest at moderate trawling frequencies, and declined only at very high levels.
- Hiddink et al. (2016), found that flatfish body condition improves where trawling maintains or increases worm production.
- Jennings et al. (2001) showed that heavy trawling increases production per unit biomass by favoring worms and other rapid-turnover groups that flatfish depend on.
- Jennings et al. (2002) found that across a 17.5-fold gradient of trawling intensity, the production of small infauna remained stable, demonstrating resiliency.
- Hiddink et al. (2016), found that flatfish body condition improves where trawling maintains or increases worm production.

- Lough et al. (1989) described ecology and distribution of juvenile cod and haddock vs sediment on Georges Bank.
- Valentine et al, (1990s) describe geology, gravel in relation to young cod habitat.
- Visel collated information from fishermen on the cultivation of marine soils and the response of commercial species. His paper included the importance of loosening soils to enable burrowing and the vertical stacking of clams, and the impact of predator removal during catch sorting.

Closing fishing areas year-round reduces hiding niches and benthic prey for young lobsters, cod, and other fish. Worms (a key food source) depend on disturbance. The coastal shelf supports exceptional productivity precisely because natural storms and fishing activity keep the bottom well-oxygenated, coarse, and biologically dynamic. Eliminating disturbance for extended periods is inconsistent with ecological history and the scientific literature. Since cod do not spawn on the bottom, but some 3-50 ft. above it, and since any pre-spawning behavior that may be closer to the bottom is unlikely to encounter a dredge or even a trawl, and since the eggs are buoyant, disturbance by trawls or dredges is not relevant.

Disturbance of the areas used for spawning is far more important and is essential for providing suitable habitat for returning young and their food. These findings align closely with long-standing observations from fishermen that disturbances keep benthic habitats productive. Without disturbance, mud and organic material accumulate until a major storm resets the system—a process that may take several decades and postpone recovery of shellfish and groundfish. Hydraulic dredging does three things that storms cannot. Dredges soften and mix the sea floor to about 10 inches, as does a farm plow, increasing and mixing the habitat for burrowing clams, lobsters, and worms. Secondly, as the catch is sorted, many predators (e.g., crabs, conchs, starfish) are removed. Thirdly, there is no waiting for decades. Bottom trawling is important, but it does not break up the hardened bottom that burrowing clams, worms, and others require.

**Proposed Management Adjustment**

I propose allowing dredging and trawling for up to 4 months (winter/spring), and retaining closures for about eight months, based on our Fairhaven experience and the logic herein. This provides time for bottom stabilization and nearly full protection of key species as baby cod, worms, and mollusks come to the bottom, while providing essential disturbances that sustain benthic productivity, including preparing the bottom for the arrival of the baby cod and its food, and further grow-out. When mid-winter dredging begins, the previous class of cod should have already moved on, and the rest should be ready to migrate or to avoid or survive fishing gear.

I recommend that three approaches be tested and evaluated. For those opposed to any disturbance, there would be a "Closed Research Area". For those opposed to any closure, I suggest a similarly-sized nearby "Open Research Area" with year-round unrestricted fishing. The third would follow my proposed management strategy – a winter/spring 4-month open season.

Each area should be monitored. This could include sediment condition, shell and gravel exposure, dissolved oxygen or redox indicators, prey production, predator abundance, juvenile fish use, shellfish recruitment, epifaunal recovery, and fishery yield. The purpose is to determine whether a carefully managed disturbance regime produces better ecological and fishery outcomes than does a year-round closure or unrestricted access. The study would last until after harvest size of the study species is reached.

These three approaches would allow the Council to base decisions on measured ecological and production responses at minimal cost and great potential benefit.

Lastly, there will be a need to prevent a rush for access during the open season. I see the Council as the arbiter of the varied interests: big and small boats, trawlers, dredgers and pots, fish and mollusks, ports, and perhaps others. The Council must restrain effort where needed while maximizing production. All shellfish species are long-lived; no production would be lost, productivity of all or most species would increase, and fishing effort would be concentrated into fewer days, lowering costs.

This proposed adjustment aligns management more closely with benthic ecology, recognizing that managed, seasonal disturbance is often necessary to sustain habitat productivity across trophic levels.

**Summary of this thesis.** The benefits of hydraulic dredging that goes about 10 inches deep along the US East coast are:

1. Removing silt, detritus, and other organic matter that build up and smother post-planktonic settlement surfaces in many areas. Dredging (and also) bottom trawling redistribute surface sediments, reducing localized buildup of fine sediments and detritus that inhibit the survival of many fish, mollusks, and polychaete worms descending from their pelagic stages.

2. Bringing long-buried, clean shells, shell hash, stones, and corals to the surface, where they (a) serve as attachment points for certain mollusks (e.g., scallops (2 times needed), oysters, mussels), corals, and certain worms (e.g., polychaetes); (b) serve as refuge habitats with interstitial spaces for baby cod and other fish, mollusks, and worms serving as protective cover from predators (e.g., fish, crabs, starfish, gastropods) during the vulnerable early growth stages, and (c) provide shell-derived physical and chemical settlement cues to molluscan larvae and post-larvae indicating suitable habitat for settlement and grow-out.

3. Dredging loosens compacted or cemented sediments that may otherwise function as a near-impenetrable substrate for juvenile through adult-stage burrowing organisms. This improves and expands habitat suitability for species such as surf clams and other infaunal bivalves that require penetrable substrate for deep burrowing and predator (e.g., conchs, starfish) avoidance. In high-clam-density areas, it creates more habitat by allowing nearly vertical stacking. In areas now without clams, it could provide expanded habitat, if the Council provides some incentive to dredge an area with little or no harvestable product.

4. Enhancing future production. When the dredge is dumped on deck, predators of mollusks and fish are separated by the crew and marketed, used as bait (e.g., crabs for conch bait), or destroyed and not returned to the ecosystem. This can have a profound impact on reducing predation on very young cod and other fish and invertebrate species. Cash incentives might help reward the removal of non-useable predators, such as small crabs, starfish and certain gastropods.

5. Creating habitat heterogeneity with disturbed and recovering patches increases habitat diversity and successional variation by creating opportunities for settlement and growth of opportunistic animals. Sensitive high-relief areas are self-protected from dredging by boulders and uneven terrain, but bottom trawls (e.g., rockhopper) have been developed for use in such areas. If protection from fishing is needed in some high-relief areas, such gear may need to be banned.

6. Increasing abundance of benthic prey species after dredging improves foraging conditions for demersal fish and other predators, thereby increasing broader ecosystem productivity.

7. Replicating some ecological functions historically provided by major storms - strong tidal scour, bioturbation by large fauna, and other natural disturbance processes that periodically rework sediments, expose buried substrate, and reset benthic successional stages. Dredging is more consistent than the major storms that are decades apart, and the 10-inch (blade and jets) depth is more similar to the tilling in agriculture, reaching deeper than storms to resurface shells and break up the impenetrable clay or otherwise compacted bottom, thus enabling burrowing species to quickly escape predators.

In closing, hydraulic dredging disperses or buries suffocating sludge, breaks up hard, impenetrable bottom, brings clean shells and stones to the surface, enables predator (crabs, starfish, conchs) removal, and provides clean shells for larval attachment and hiding. Annual disturbance is essential, as is shown by the one-year blip in catch when a major hurricane passes. Closures for a year or more quickly stop production. For example, closing an area to scallop dredging to protect a large set of scallops, immediately takes that area out of further production. Incoming new scallops need clean shells for initial and then secondary attachment one year later.

Many, if not most, high relief areas are inherently protected from dredging, but not all trawling by rocky ledges, ridges, canyons, and boulders. These were deposited as ancient glaciers retreated and are mapped by NOAA, USGS, and Canada. A vessel's GPS, or its own maps, can help avoid them. In areas where protection is needed, perhaps because of some unique epifaunal life, corals, or other special habitat, these can be defined and avoided. Most likely, there will be a feature, such as canyons, outcrops, or boulders, that will, in itself, cause it to be non-fishable. As an example, when the New Bedford Outer Harbor re-opened, we snagged a lost, huge quahog dredge (non-hydraulic) that had caught on a ledge, probably during a foggy day decades before. One of life's lessons from my father followed: "Nothing dies of old-age out here, my boy".

As noted, two critical needs for scallops, many mollusks, and worms are a clean place to alight, attaching with byssal threads for a few days or months of growth, and then, finding a home where their siphon or breathing apparatus can reach above suffocating silt or detritus. Sea scallops need to let go and attach a second time after about a year. Dredging, trawling, and major storms provide such surfaces. From childhood, my grandfather told us bay scallops would be abundant two years after a hurricane came through Fairhaven. As Hurricane Carol approached in 1954, we were getting ready.

Hydraulic dredging is often treated as an ecological villain. That is too simplistic. In many habitats, it is a tool that can increase productivity if used carefully. The goal should not be to eliminate disturbance but to manage it intelligently.

Much of the information about hydraulic dredging is known by fishermen rather than being a part of the formal academic literature. Fishermen observe bottom conditions, sediment hardness, shell exposure, predator abundance, recruitment pulses, and catch response repeatedly over years and even decades. That knowledge is not anecdotal in the dismissive sense; it is long-term, fine-scale ecological observation. Peer-reviewed work on Georges Bank cod spawning has already shown that fishermen's ecological knowledge can identify patterns missed or blurred by conventional surveys. The same principle should apply to hydraulic dredging and shellfish habitat. A Council decision that treats fishermen's observations as secondary to short-term experimental studies risks missing the actual mechanisms that sustain production. The cited paper by Visel is one of the few that contains views and observations of fishermen about disturbances.

The scientific record is incomplete without fishermen's knowledge. Cooperative research with scientists and fishermen is needed. Any papers without both participants among the authors should be suspect. There must be active roles for fishermen to ensure strategies are practical, enforceable, and acceptable. As my father said, "Fishermen have to agree because there are not enough cops for all the foggy days."

Photos below show the 4th year productivity after the New Bedford Outer Harbor reopened, when the littlenecks reached legal size. Note the sub-legal quahogs "for next year" among the old bulls and littlenecks. 30 large, 110-pound bushels of very valuable littlenecks were caught in 2-3 hours. Only they were kept.

**Conclusion**

The goal must not be to eliminate disturbance, but to manage it intelligently, in harmony with natural seabed processes. It is essential in many areas. Adjusting closures as proposed herein would maintain strong reproductive protection while sustaining benthic productivity for cod, scallops, corals, lobsters, clams, worms, and other species that depend on a dynamic, oxygenated seabed with hiding and attachmenrt places for the very young. Proper administration, as proposed, can increase fisheries production broadly, create jobs at sea and ashore, and boost the nation's food supply, while reducing our seafood imports. This proposal is easily testable. Let's find out!

Thank you for your consideration. I would welcome the opportunity to provide additional references or to discuss these concepts further with your habitat and groundfish committees. If desired, staff and I will participate, at our expense, in the planning and oversight of follow-on investigations.

Lastly, I have had no contact, nor affiliation, with any interest group about this matter. I do not have "a dog in the fight". I am simply honoring and sharing my father's request.

Respectfully,

John T. Everett

Dr. John T. Everett (Bio)

Chair and CEO. Everett-Vehrs Conservation and Research Foundation, and,

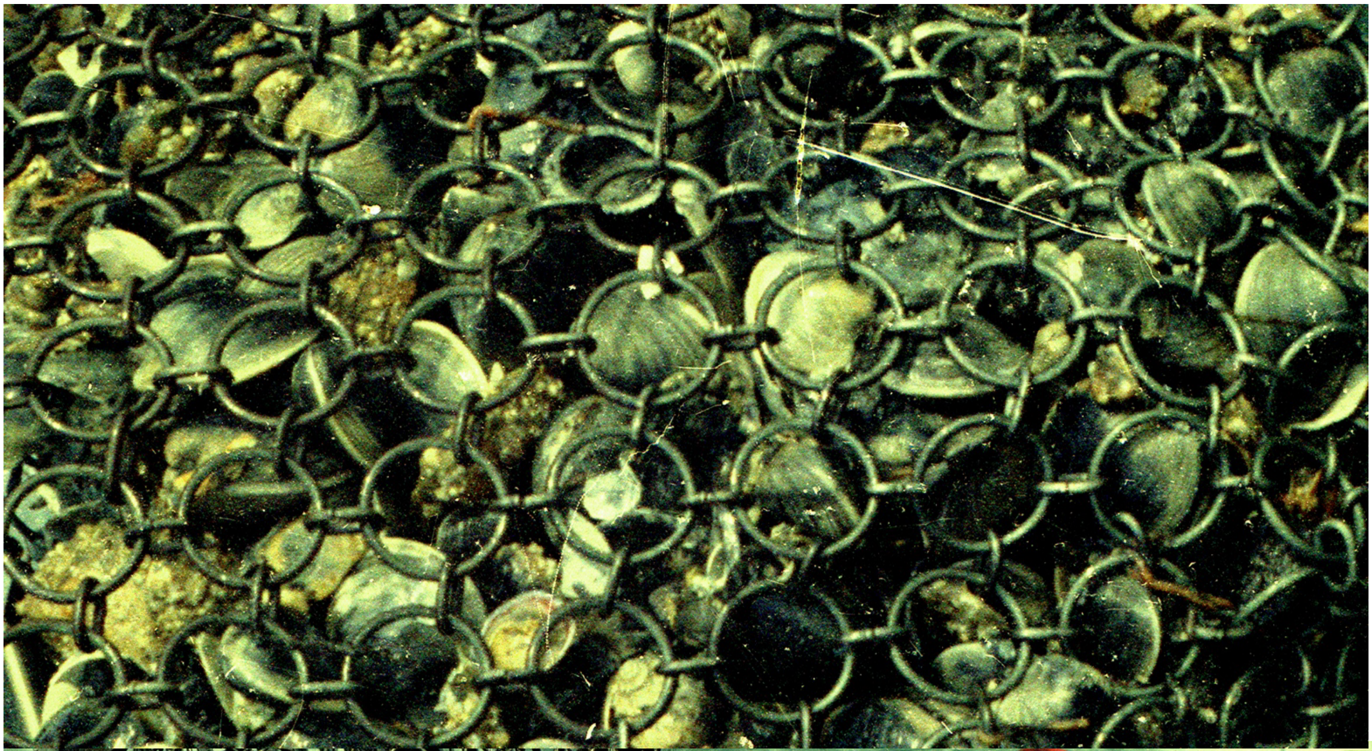
President, Ocean Associates, Inc.

"Love nature as much as we do? Help support our work for a healthier planet!"

**In the photos on the next page:**

Close-up of chain bag and deck, showing little necks and bulls in 12-minute tows in winter 1970 in the 4th year after re-opening of outer harbor after 60 years of closure.

John R. (foreground) and Antone R. Everett, Jr., washing the hydraulic dredge catch (about 3 bushels of littlenecks/tow) for sorting on what had been their father's boat.



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