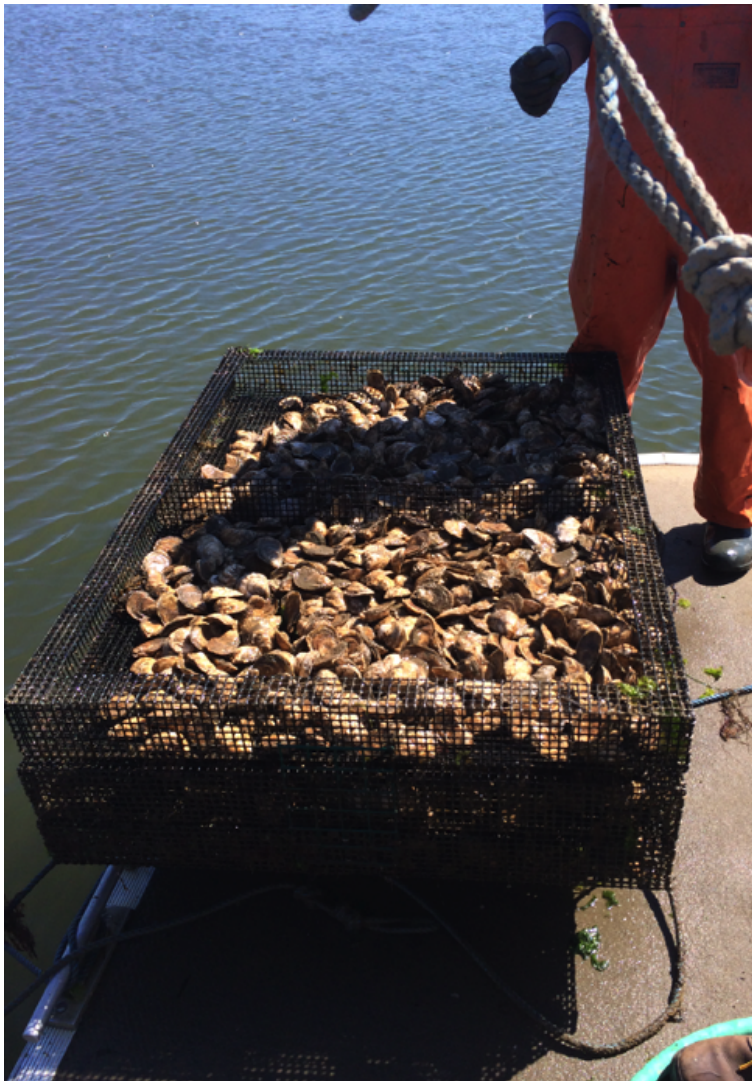
Aquaculture in Shared Waters
Husbandry

Dana Morse[1], Samuel Belknap[2], and Rebecca Clark Uchenna[3]

When people think of sea farming, it's usually the husbandry part that they have in mind: tending the crop, working on the boat, etc. Husbandry is a rewarding part of the aquaculture process, and good husbandry is critical to success. Paired with strong financial management and sales and marketing, husbandry is where the rubber meets the road.

Your goal as the farmer is very simple, but difficult to do well: ***Successful aquaculturists keep their animals and plants at optimum health.*** Another way to think about this is to keep the crop at minimum stress: low stress equals faster growth, improved survival, and maximum quality. Good farmers know their crop, their site, and their gear.

Sources of stress vary by crop. For example, seaweeds have different requirements than oysters, mussels, or salmon. That said, some basic themes apply to all, and this sheet covers some of the common considerations.



A clean cage and appropriate stocking density for the site will contribute to success for this oyster farmer. *Photo: Dana Morse*

1: Dana Morse • Marine Extension Associate, Maine Sea Grant College Program and University of Maine Cooperative Extension, 193 Clark's Cove, Darling Marine Center, Walpole, ME 04573 • 207.563.8186 • dana.morse@maine.edu

2: Samuel Belknap • University of Maine • 234C South Stevens Hall Orono, ME • 207.992.7726 • samuel.belknap@maine.edu

3: Rebecca Clark Uchenna • Island Institute • 386 Main St Rockland, ME • 207.691.2505 • rclark@islandinstitute.org

Know Your Crop Before You Choose A Site

Siting is discussed more fully in the companion fact sheet on that topic, but farmers should know the basic requirements and ideal conditions for their crop: temperature, salinity, food availability, water quality, proper densities etc. Farms that are improperly sited are destined for difficulty, no matter the husbandry skill of the operator. For more detail, consult the fact sheet "**Getting To Know Your Water.**"

Choose The Right Gear

There are many choices for equipment, even for a single species. Producers have to ask themselves the question, "What is the best equipment for me at my site?" Decisions will vary, but some important considerations include the following:

- **Biological effectiveness:** Does your crop grow well, with that specific equipment at that site? What information do you have to justify your conclusions?
- **Physical effectiveness:** Does the gear function well within the environment? Moorings, lines, buoys and hardware need to be robust enough to handle the weather, tides, and work associated with growing the crop.
- **Cost:** What is the up-front cost, vs. the expected useful life of the equipment?
- **Ergonomics:** Is the gear easy to work with, and will you and your crew be able to work without excessive strain or likelihood of injury?

Remember! New farmers should plan on doing their homework, research gear options ahead of time, and prepare for experimentation. What works on someone else's farm might not work on your site ... or it might work better for you. Adaptation and experimentation are constant.

Pay Attention to Detail and Be An Active Manager

Successful farmers are observant and think ahead. Even little details might be important; it pays to keep your eyes open, and to use a good recordkeeping system. For example, if you find unexpected mortalities on the farm, looking ***back*** to your notes can provide valuable clues as to what may have happened—and how to avoid a repeat. Thinking ***ahead*** is just as important. Plan your husbandry activities against your sales and marketing, and with your cash flow/availability to keep your farm in smooth production, your crop in the marketplace, and your bank account in good shape.

Biofouling

- Biofouling is the growth of unwanted marine organisms on your culture cages, nets and on the crop itself. Anything left in the marine environment for any length of time is bound to attract settling shellfish, plants and other organisms, each of which can decrease the effectiveness of your equipment and the growth of your crop*.
- Develop a strategy to keep cages and nets clean to maintain ideal water flow. Several options are easily available for sea farmers: air-drying, power-washing, hypersaline dips, or simply having extra clean gear to swap out when one set gets fouled.
- No matter what your strategy is for fouling control, be sure to account for this in your farm financial management: equipment purchase and repair, labor, fuel, insurance, etc.

Fouled mussel line.
Photo: Dana Morse

Dealing with Predators and Pests

Common *predators* of shellfish include crabs, starfish, lobsters, snails and diving ducks. Pests can include things that are not necessarily lethal to the crop, but which can still cause a problem, such as mud blister worms in oysters, or snail eggs on seaweed. Ideal predator deterrence is efficient, cost-effective, and has minimal environmental disturbance. Knowing predator life cycles and behavior is critical to good deterrence. Some of the common methods for avoiding predators and pests include:

- **Physical barriers:** cages, nets or other containment systems that separate your crop from the problem.
- **Avoidance by location and siting:** siting a farm that has minimal occurrences of a specific predator or pest. For example: maybe a site has a barnacle set at one depth, but not another; or a place where the salinities are a bit low for crabs to thrive, but good for oysters; or a place where the flow is high enough to keep the fouling down on a line of kelp. Again, this is a place where knowing the crop and knowing the site is critical.
- **Manual control:** sometimes a hands-on management approach is necessary. You may have to periodically handle your gear and crop to get rid of a predator or pest. Examples might include tumbling oysters to reduce a barnacle set, or removing green crabs that have managed to get under a net on a clam farm. Manual control is expensive, but if your predator/pest control can be combined with another activity (such as regular tumbling of oysters), then you can minimize this cost. Farmers should also be aware that manual treatments may have damaging effects early or late in the season, contributing to winter mortality. Small tests are advised before large changes are made.

Green crabs have overtaken this cage of small scallops. ***Photo: Terry Gray***

Biosecurity

Biosecurity refers to procedures that may be taken to protect humans or animals against disease or harmful biological agents. No farmer wants to introduce a disease, predator, or unwanted organism to the farm, and since sea farms are connected by water, problems on one farm can spread to others. To limit biosecurity risks, farmers should pay particular attention to the movement of animals/plants from one site to another, and the movement of people and equipment on and off the farm—including visitors. A written plan is strongly encouraged to establish procedures that can limit risk. Specific activities can include health screening for any seed crop that you plan to plant on the farm, ensuring that equipment (boats, machinery, and even things like boots and foul weather gear) is clean before being allowed on the farm, and establishing preventive disinfection if warranted. Not all diseases can be avoided, but the cost of good prevention is well worth the costs when weighed against potentially heavy losses.

Recordkeeping

Recordkeeping is essential for farming success. Notes on tides, temperatures, farm production, densities, predators, timing and treatments for biofouling and algal blooms and other details can help to avoid repeat mistakes, can help farmers to focus correctly on new development efforts and can help you qualify for such things as crop insurance. Your memory can change, so write it down! The more you can observe and record, the better your ability to analyze your farm and business will be. Waterproof notebooks are an inexpensive, easy-to-use and valuable resource for any sea farmer.

* Environmental Stewardship

While anti-fouling paints are in common use with marine vessels, aquaculture producers are encouraged to limit use of any anti-fouling substances on equipment used to grow the crop. Chemicals which have good anti-fouling properties - such as copper - can reside in shellfish tissue over the long term, and pose a human health risk. Similarly, growers can take precautions to limit other environmental interactions, for example: using clean-burning outboards or newer engines rather than older models, and using food-grade hydraulic fluid as an alternate to traditional petroleum-based products.

Resources

Information on growing Oysters, Mussels, Razor Clams, Scallops and Kelp

- http://www.seagrant.umaine.edu/resources-for-shellfish-growers/species/mussel
- http://www.seagrant.umaine.edu/resources-for-shellfish-growers/species/american-oyster
- http://www.seagrant.umaine.edu/resources-for-shellfish-growers/species/razor-clam
- http://www.seagrant.umaine.edu/resources-for-shellfish-growers/species/scallop

Aquaculture in Shared Waters fact sheet series:

- http://www.seagrant.umaine.edu/Resources-and-news

Kelp Farming Manual:

- http://www.oceanapproved.com/s/OceanApproved_KelpManualLowRez-9pqe.pdf

Advice to new (and experienced) producers, from the East Coast Shellfish Growers Association:

- http://www.ecsga.org/Pages/Resources/RookieMistakes.html

Publications from the Northeast Regional Aquaculture Center (NRAC):

- A nice brochure on dealing specifically with shellfish predators, from WHOI Sea Grant: http://web.whoi.edu/seagrant/whoi-h-05-004-walton-w-c-predators-of-co/
- A great resource for growers is the list of publications from NRAC. There are several guides and a large number of fact sheets on everything from growing oysters and mussels, to business operations and biosecurity, all available for download. NRAC publications can be seen and downloaded from: https://agresearch.umd.edu/nrac/publications-0

The goal of these fact sheets is to inform readers about the possibilities of integrating aquaculture with current fishing and seafood businesses, and to diversify incomes along Maine's working waterfront.

This document was produced courtesy of funding though the NOAA Sea Grant Aquaculture Research Program 2012, Award #NA10OAR4170081, for the project "Aquaculture In Shared Waters" - Teresa Johnson, Principal Investigator, Univ. of Maine (Orono) and D. Morse, Co-Principal Investigator, Maine Sea Grant and Univ. of Maine Coop. Extension. http://www.seagrant.umaine.edu/aquaculture-in-shared-waters.

Created and produced by

ISLAND INSTITUTE

Nick Battista • Marine Programs Director • 207-691-3554 • nbattista@islandinstitute.org • www.islandinstitute.org

Revised July 6, 2016